US009001508B2

(12) **United States Patent**
Mori et al.

(10) **Patent No.: US 9,001,508 B2**
(45) **Date of Patent: Apr. 7, 2015**

(54) **OPENABLE AND CLOSABLE ELECTRONIC DEVICE WITH DISPLAY**

(71) Applicant: **Panasonic Corporation**, Kadoma-shi, Osaka (JP)

(72) Inventors: **Takeshi Mori**, Osaka (JP); **Hitoshi Nakatani**, Osaka (JP); **Shun Shimazaki**, Osaka (JP); **Yuichiro Tachibana**, Osaka (JP); **Shuji Yasuoka**, Osaka (JP)

(73) Assignee: **Panasonic Intellectual Property Management Co., Ltd.**, Osaka (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 199 days.

(21) Appl. No.: **13/765,450**

(22) Filed: **Feb. 12, 2013**

(65) **Prior Publication Data**

US 2014/0055922 A1 Feb. 27, 2014

(30) **Foreign Application Priority Data**

Aug. 24, 2012 (JP) 2012-185584

(51) **Int. Cl.**
H05K 5/00 (2006.01)
H05K 5/02 (2006.01)
G06F 1/16 (2006.01)

(52) **U.S. Cl.**
CPC ***H05K 5/0217*** (2013.01); ***H05K 5/0017*** (2013.01); ***G06F 1/162*** (2013.01)

(58) **Field of Classification Search**
USPC 361/679.55
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,144,290	A *	9/1992	Honda et al.	345/156
5,196,991	A *	3/1993	Hsieh	361/679.17
5,796,576	A *	8/1998	Kim	361/679.28
7,576,982	B2 *	8/2009	Wang et al.	361/679.27
7,619,882	B2 *	11/2009	Nakajima et al.	361/679.26
7,800,893	B2 *	9/2010	Tracy et al.	361/679.27
7,974,091	B2 *	7/2011	Griffin	361/679.56
8,208,245	B2 *	6/2012	Staats et al.	361/679.02
2004/0105227	A1 *	6/2004	Tanimoto et al.	361/683
2006/0256516	A1 *	11/2006	Cho	361/683
2011/0085297	A1 *	4/2011	Wright-Johnson et al.	361/679.55
2011/0127184	A1 *	6/2011	Kawada et al.	206/320

FOREIGN PATENT DOCUMENTS

JP	2004-094647	3/2004

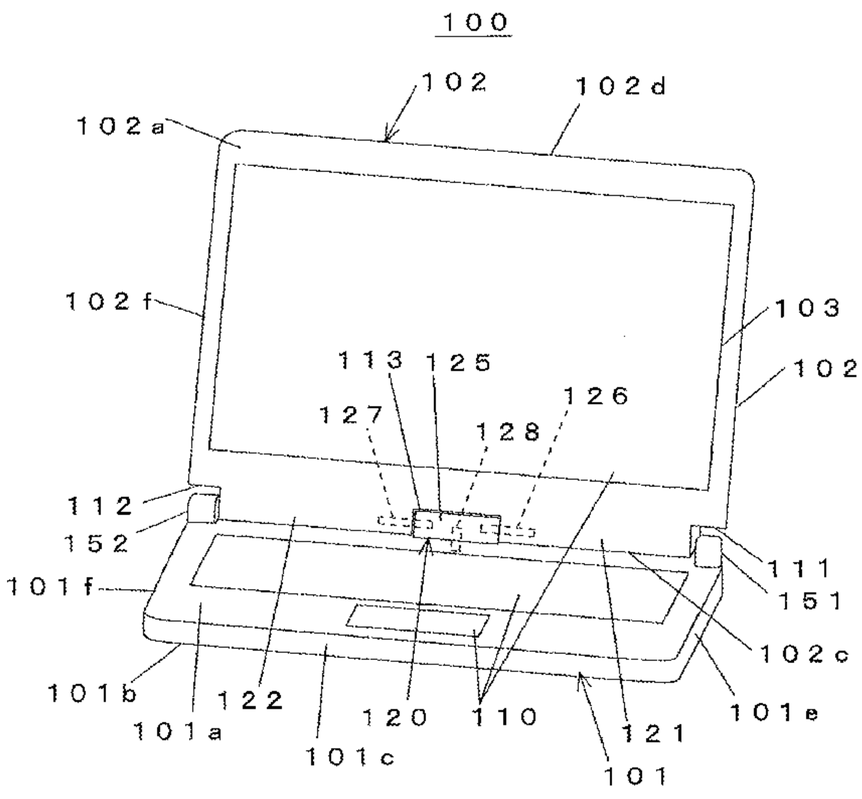
* cited by examiner

Primary Examiner — Lisa Lea Edmonds
(74) *Attorney, Agent, or Firm* — Hamre, Schumann, Mueller & Larson, P.C.

(57) **ABSTRACT**

An electronic device (**100**) includes: a first casing (**101**); a second casing (**102**) that is connected to the first casing (**101**), and that has a display (**103**); a projecting component (**152**) that projects from a top side surface (**101***a*) of the first casing (**101**), and is positioned on the top side surface (**101***a*) of the first casing (**101**) at such a position as to abut against the display (**103**) when the electronic device (**100**) is closed; and a movable support section (**170**) configured to support the projecting component (**152**) so as to allow the projecting component (**152**) to move relative to the first casing (**101**) such that an amount of projection of the projecting component (**152**) from the top side surface (**101***a*) of the first casing (**101**) is reduced when the projecting component (**152**) is pushed by the display (**103**) in the case of the electronic device (**100**) being closed.

10 Claims, 7 Drawing Sheets



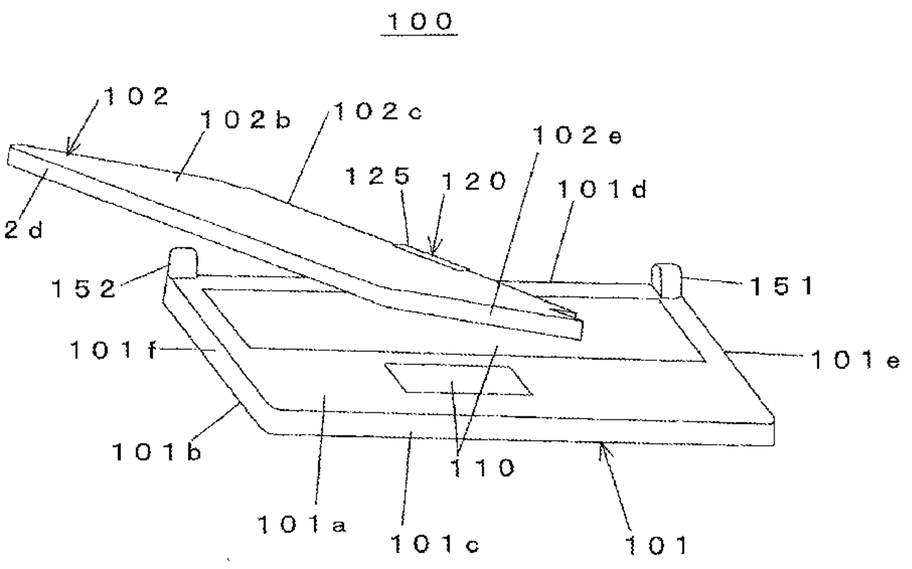


Fig. 1

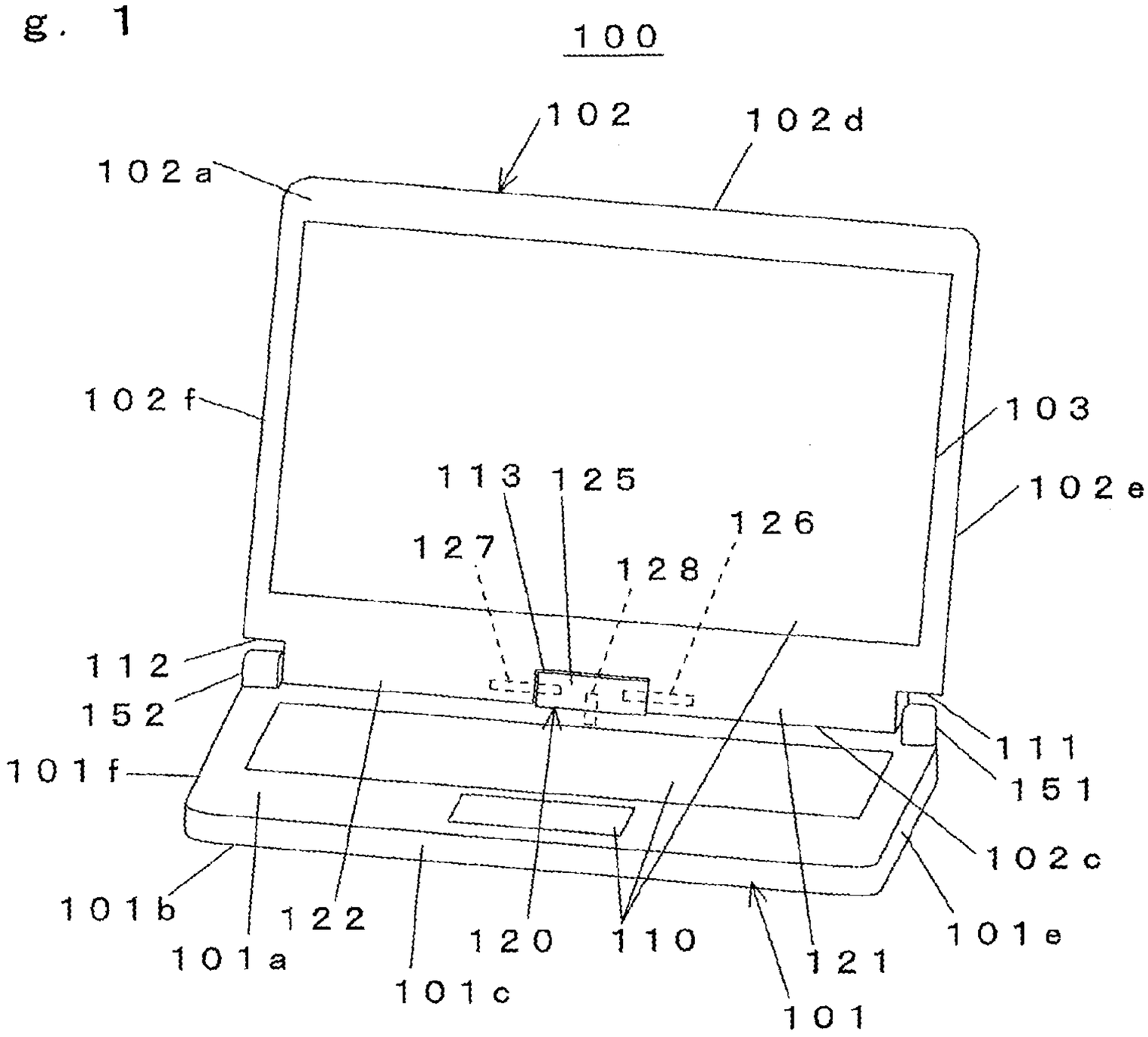

100
102
102d
102a
102f
103
113
125
126
127
128
102e
112
152
111
151
101f
102c
101b
122
120
110
101e
101a
121
101c
101

Fig. 2

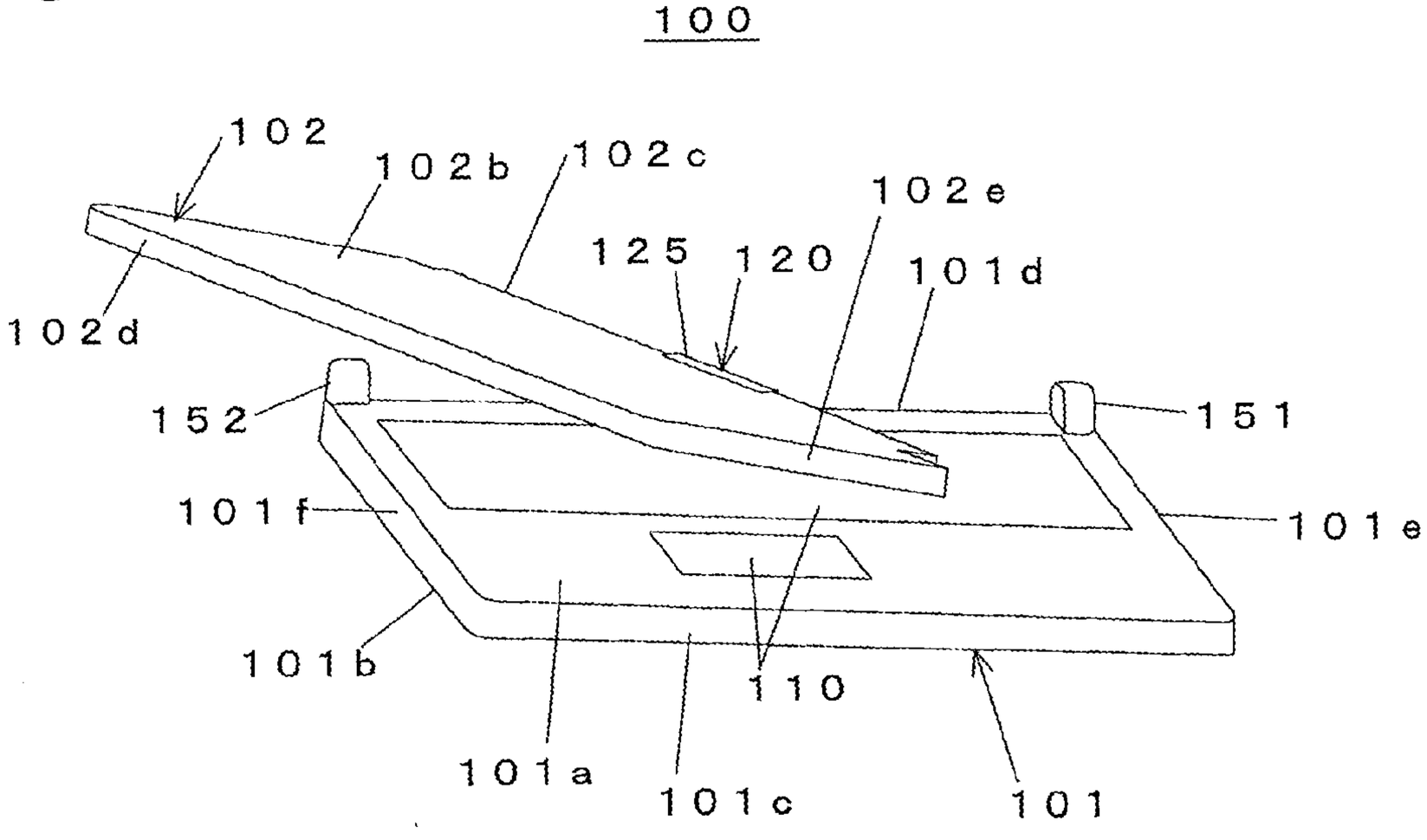

100
102
102b
102c
102e
125
120
101d
102d
152
151
101f
101e
101b
110
101a
101c
101

Fig. 3

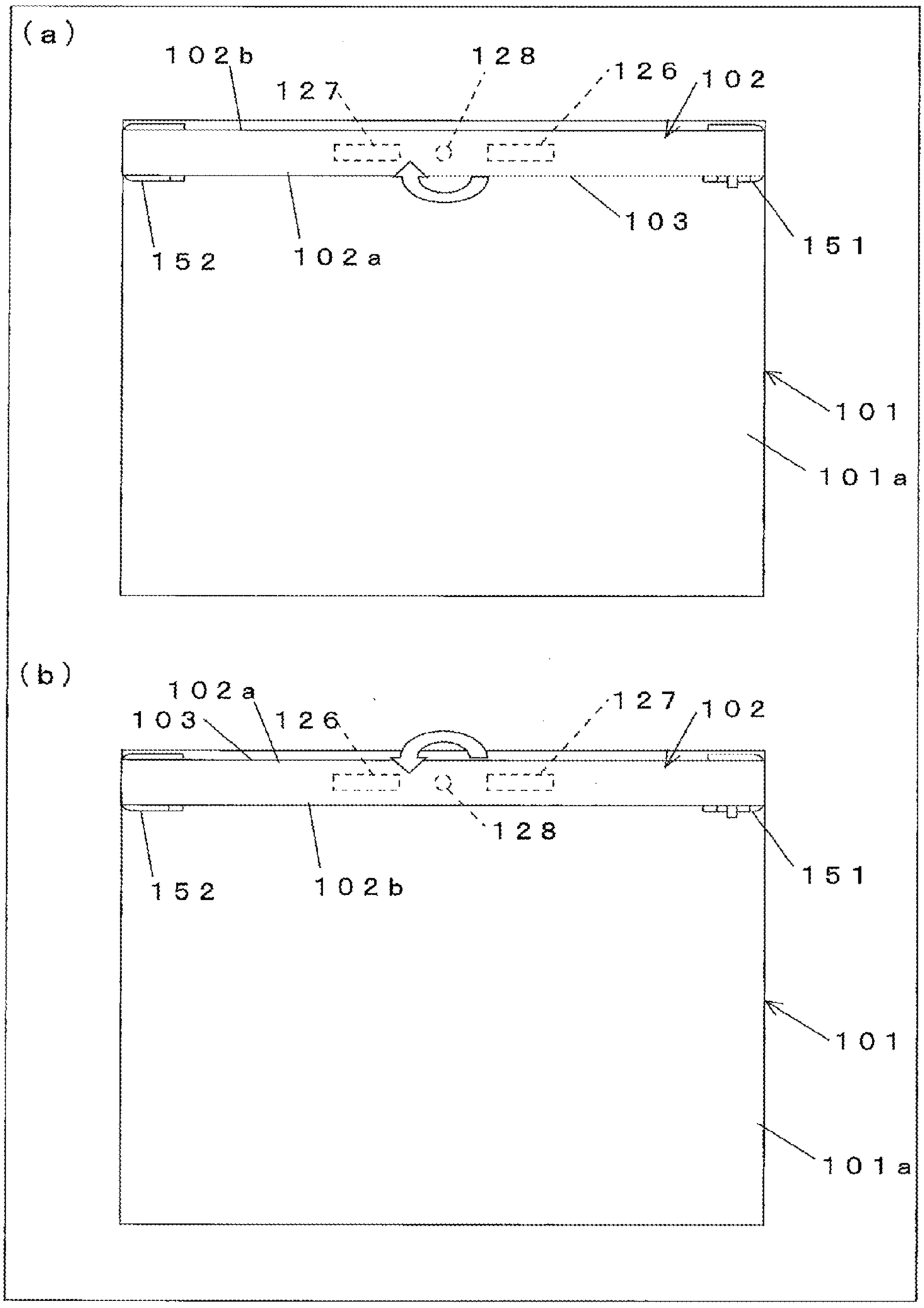
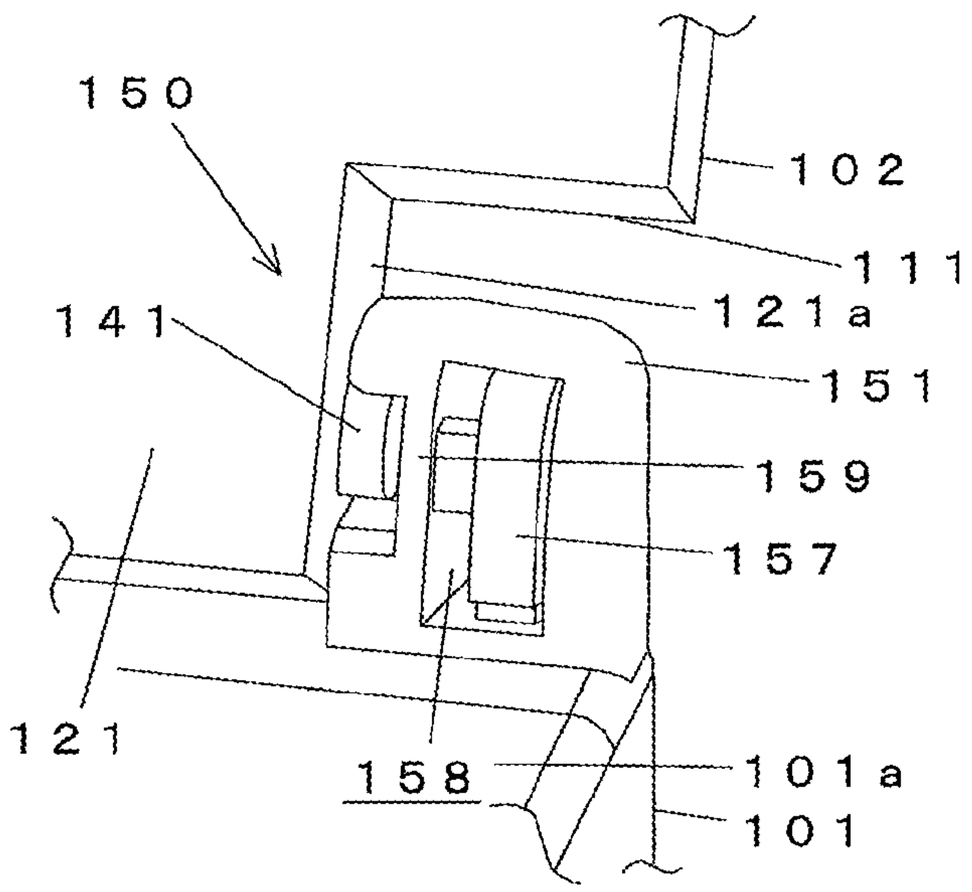
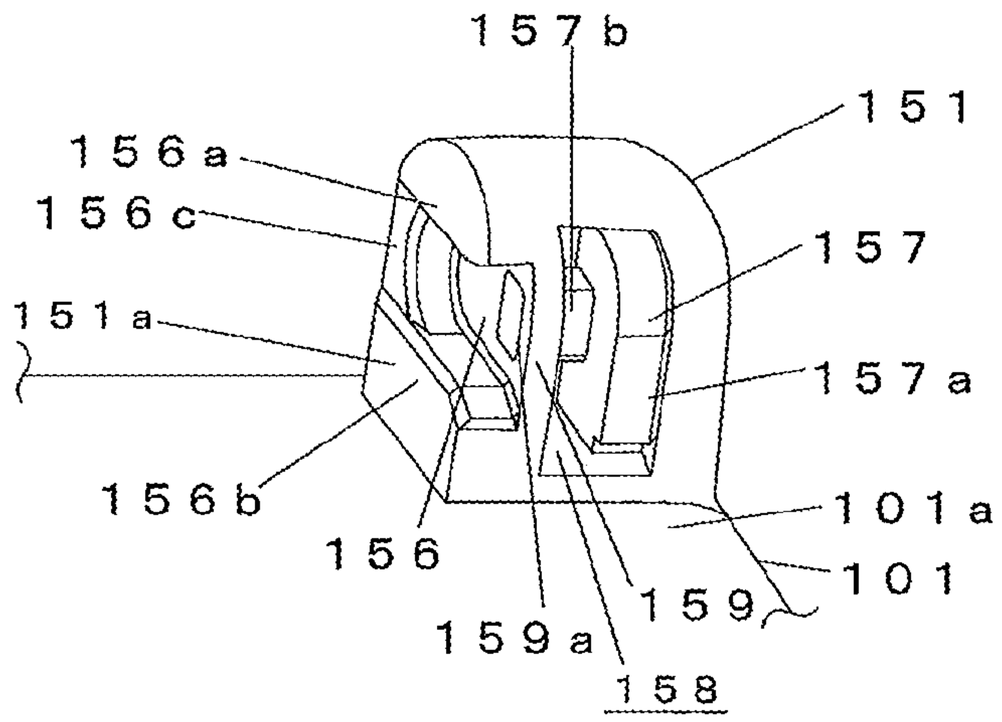

(a)
102b
128
127
126
102
103
152
102a
151
101
101a
(b)
102a
103
126
127
102
128
152
102b
151
101
101a

Fig. 4

(a)


150
102
111
121a
141
151
159
157
121
158
101a
101

(b)


157b
151
156a
156c
157
151a
157a
156b
101a
156
101
159
159a
158

(c)

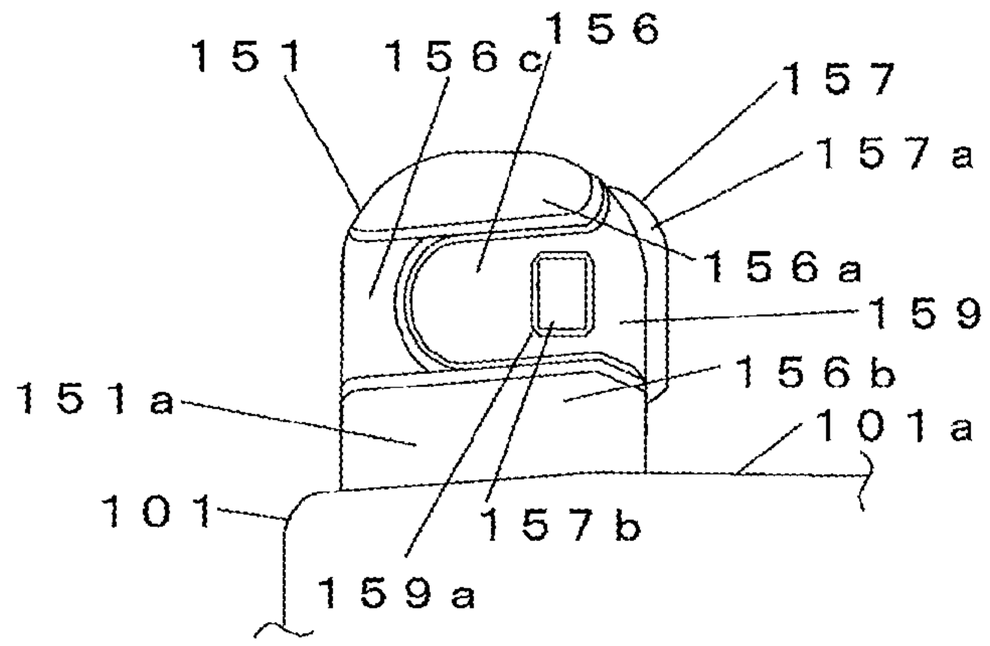

151
156c
156
157
157a
156a
159
156b
151a
101a
101
157b
159a

Fig. 5

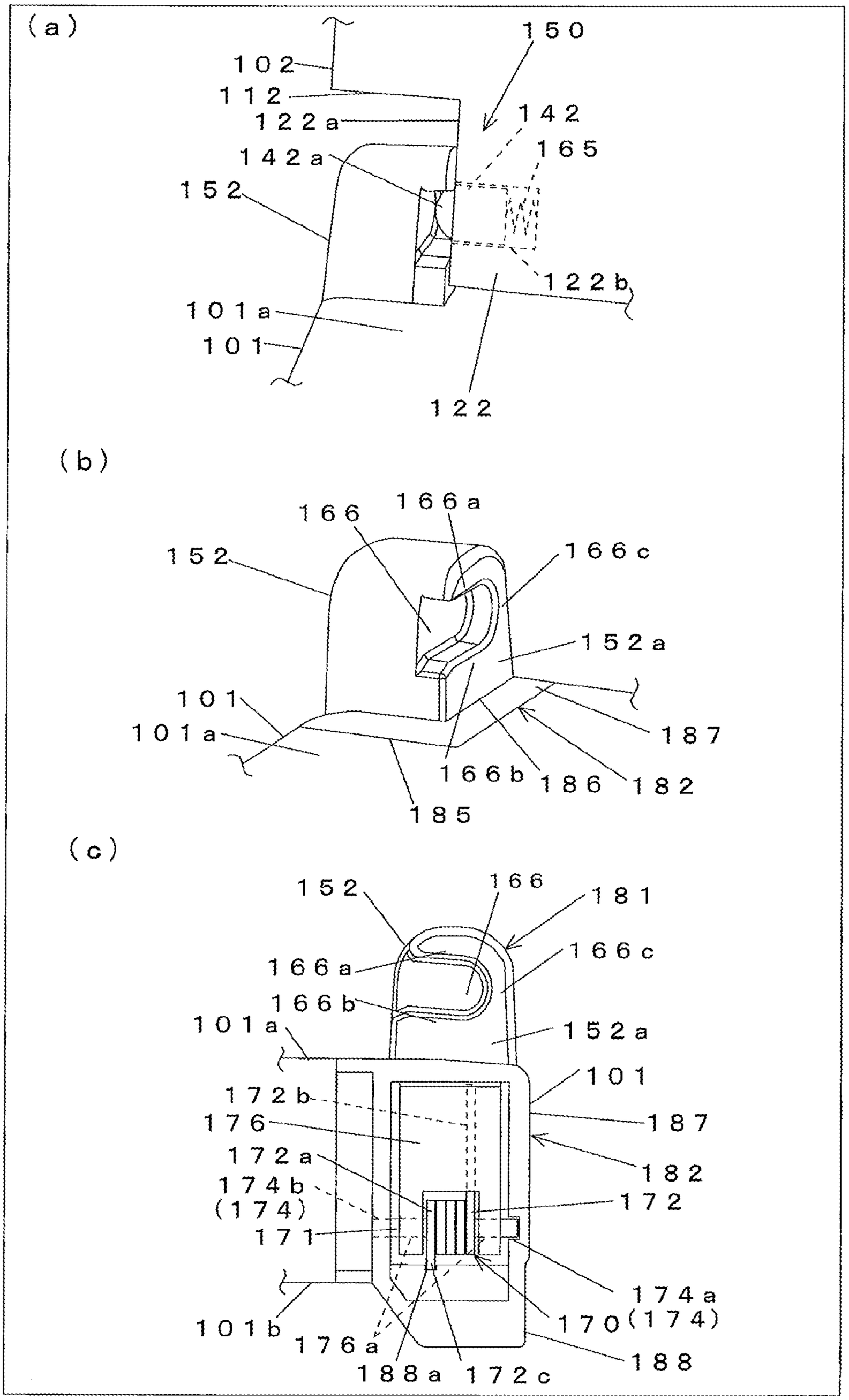

(a)
102
112
122a
142a
152
101a
101
122
150
142
165
122b
(b)
166
166a
152
166c
152a
101
101a
187
185
166b
186
182
(c)
152
166
181
166a
166c
166b
101a
152a
101
172b
176
187
172a
182
174b
(174)
172
171
174a
101b
176a
188a
172c
170(174)
188

Fig. 6

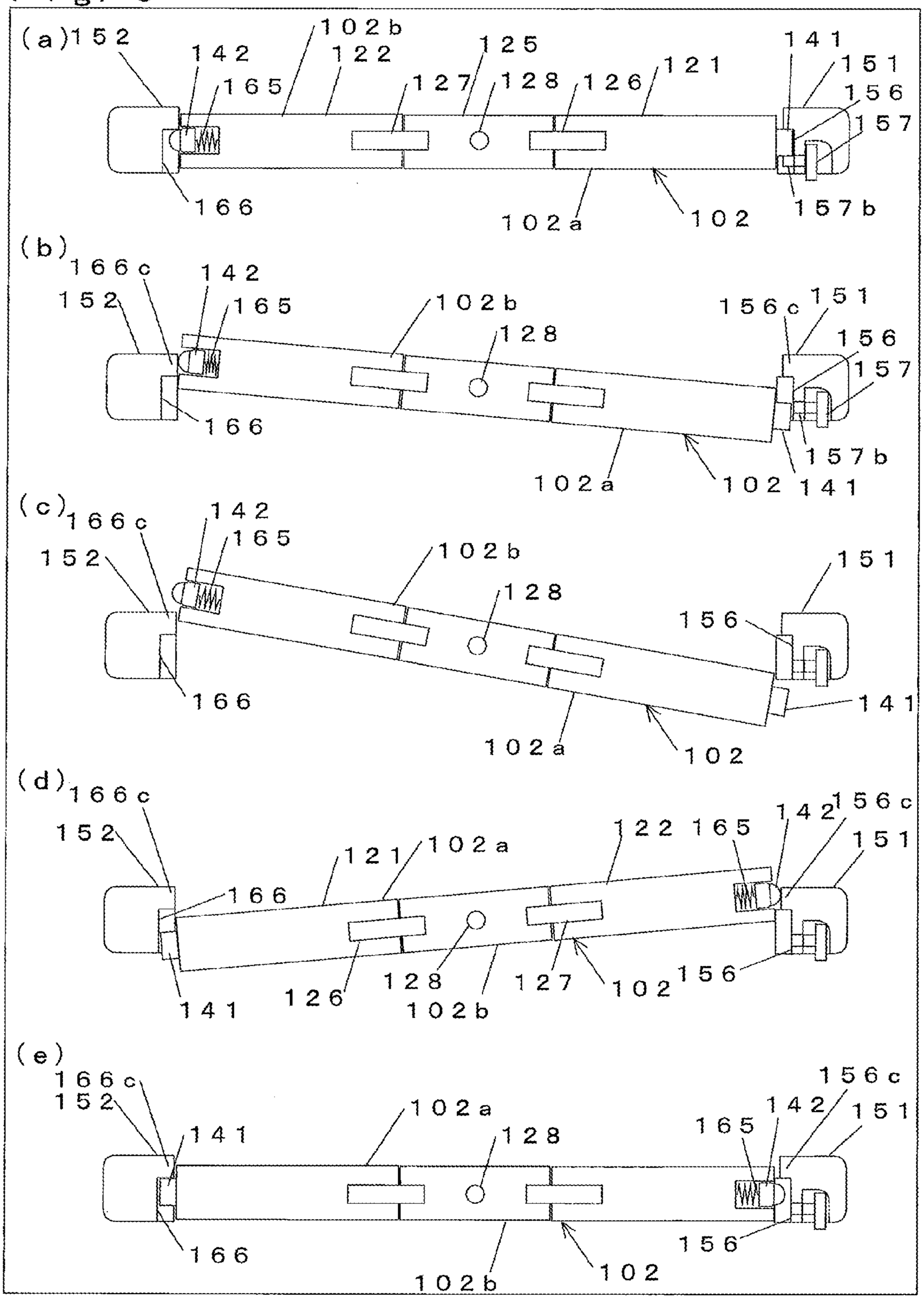

(a)
152
142
165
102b
122
125
127
128
126
121
141
151
156
157
166
102a
102
157b
(b)
166c
142
152
165
102b
128
156c
151
156
157
166
102a
102
141
157b
(c)
166c
142
165
152
102b
128
151
156
166
141
102a
102
(d)
166c
152
166
121
102a
122
165
142
156c
151
141
126
128
102b
127
102
156
(e)
166c
152
141
102a
128
165
142
156c
151
166
102b
102
156

Fig. 7

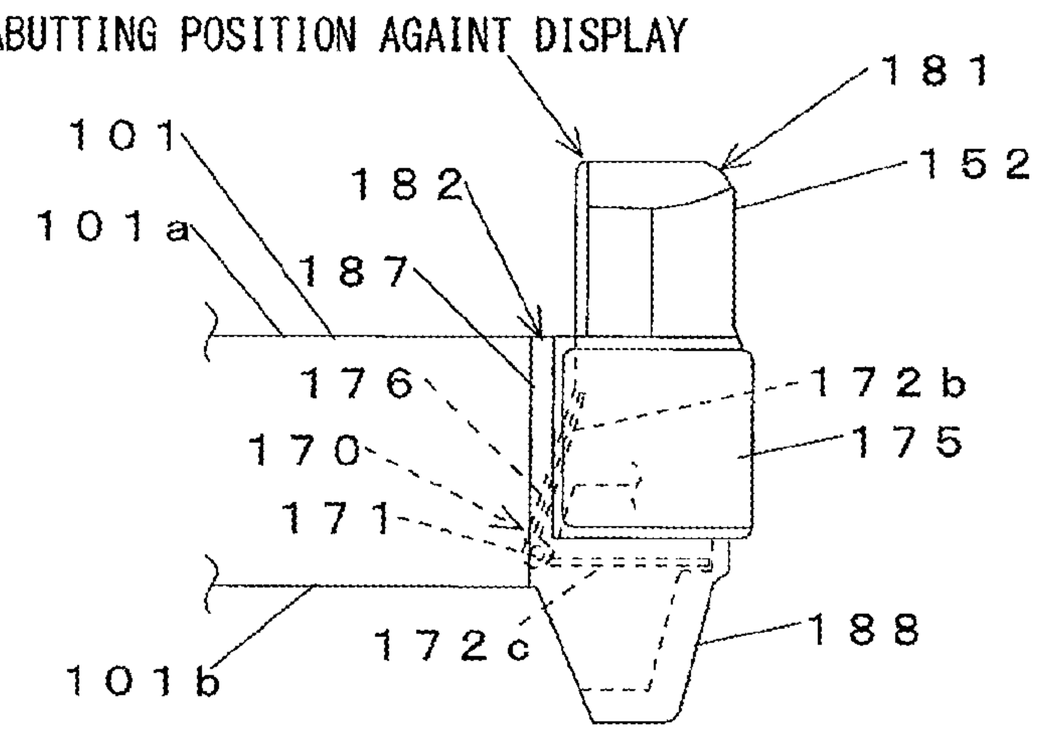

ABUTTING POSITION AGAINT DISPLAY
181
101
182
152
101a
187
176
172b
170
175
171
172c
188
101b

Fig. 8

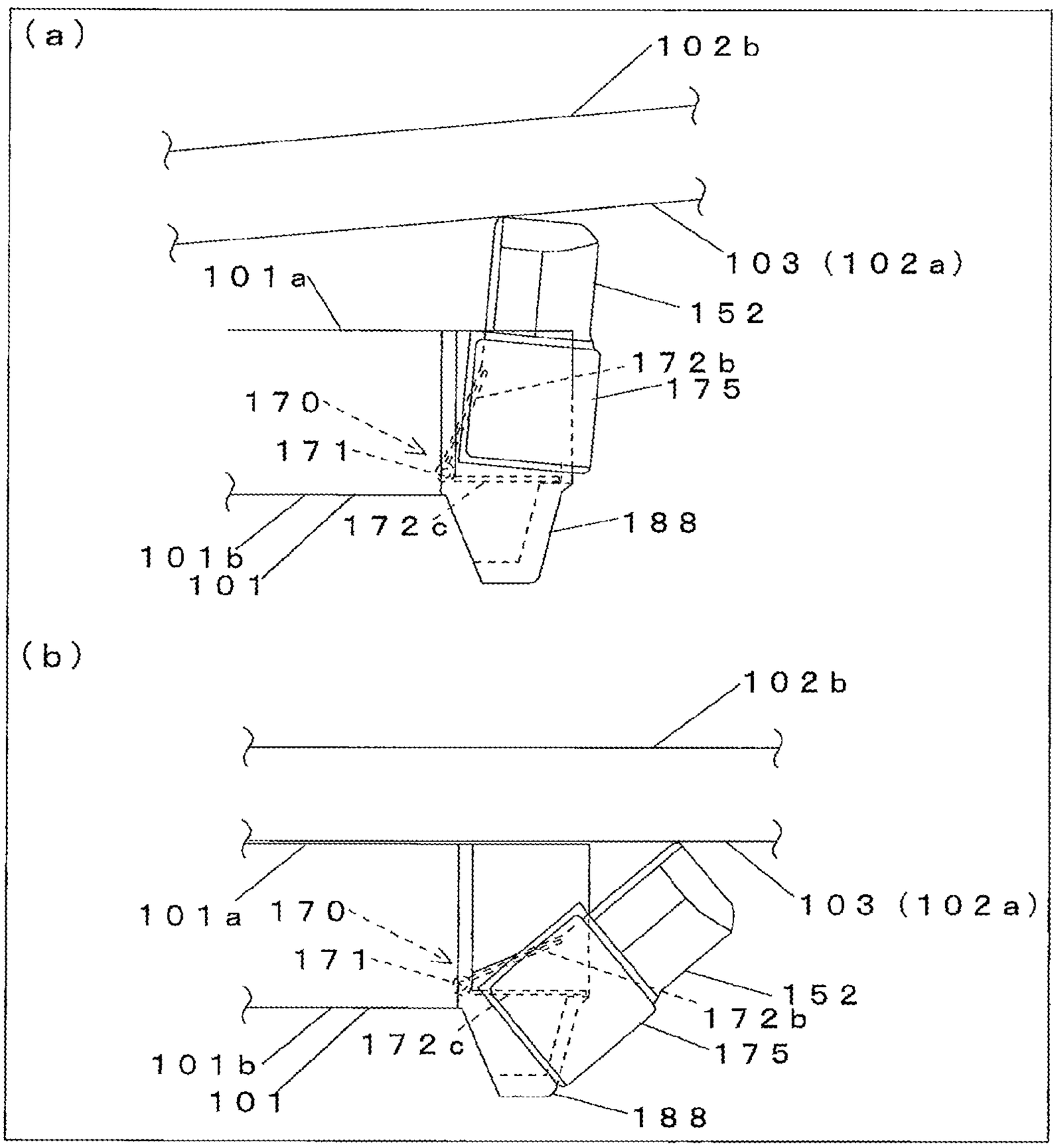

(a)
102b
103 (102a)
101a
152
172b
175
170
171
172c
188
101b
101
(b)
102b
101a
170
171
103 (102a)
152
172b
172c
175
101b
101
188

Fig. 9

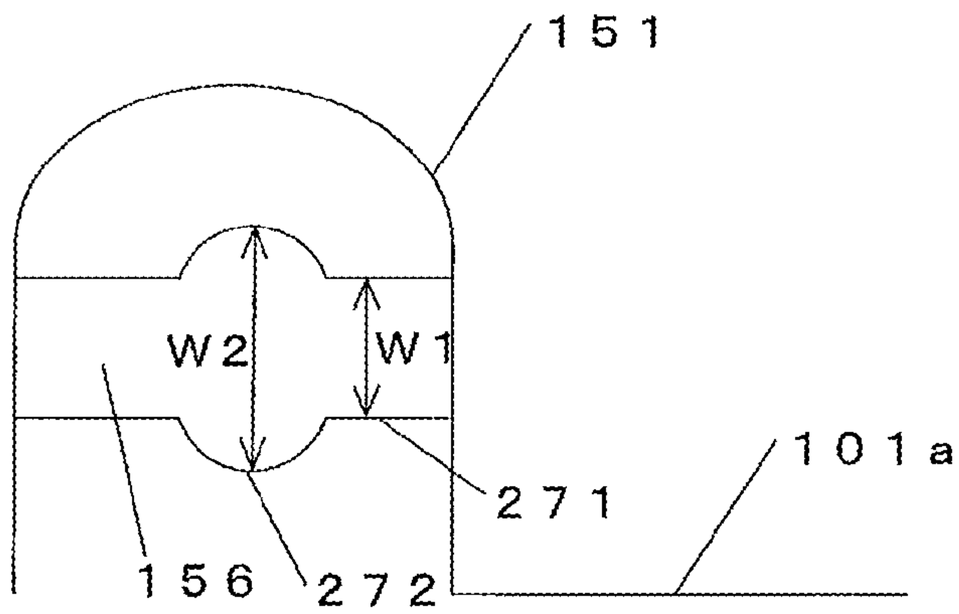
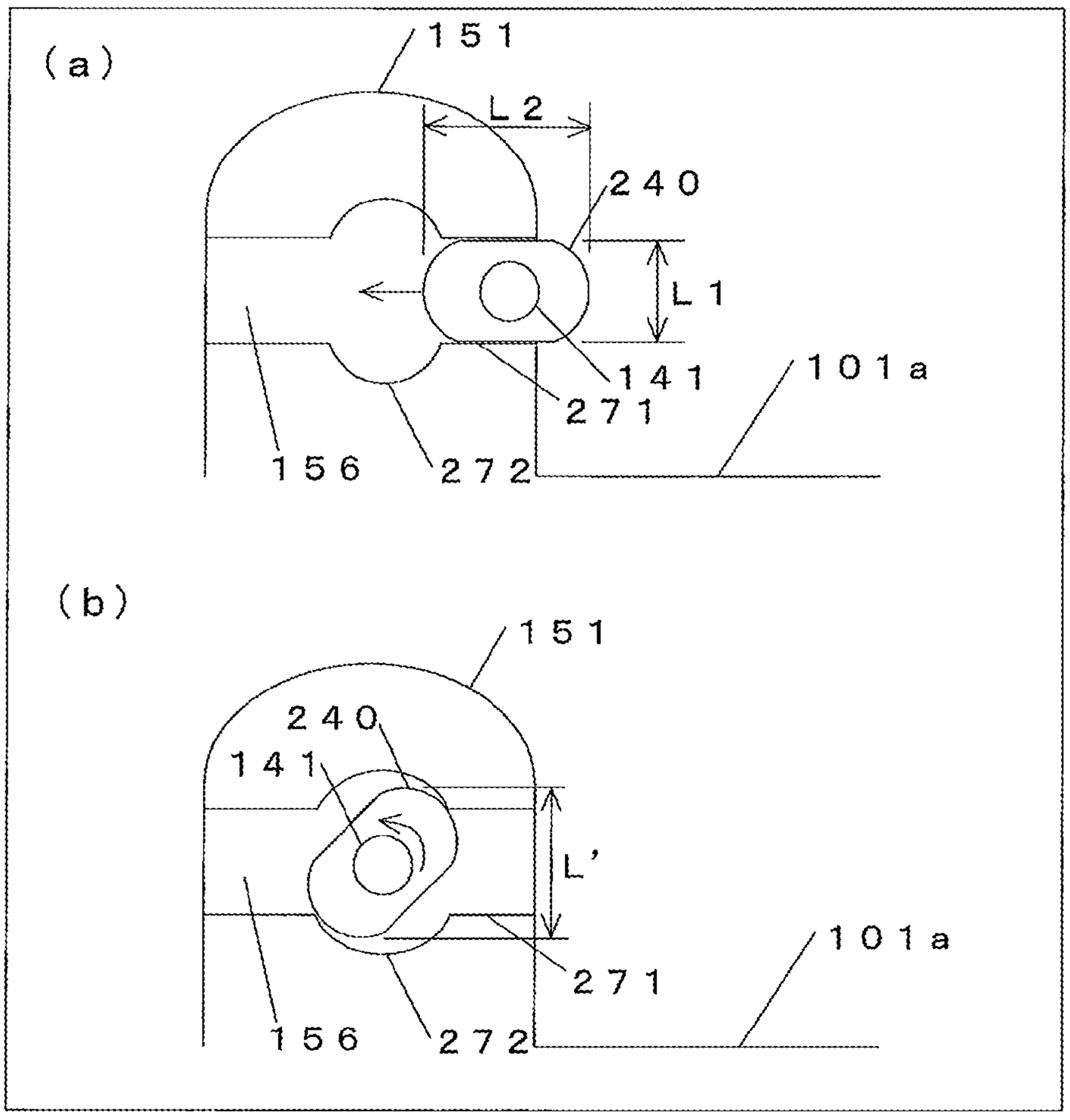

151
W2
W1
271
101a
156
272

Fig. 10


(a)
151
L2
240
L1
141
271
101a
156
272
(b)
151
240
141
L'
271
101a
156
272

OPENABLE AND CLOSABLE ELECTRONIC DEVICE WITH DISPLAY

BACKGROUND

1. Field

The present disclosure relates to an electronic device that has a first casing and a second casing having a display, and that is openable and closable.

2. Description of the Related Art

Japanese Laid-Open Patent Publication No. 2004-094647 discloses an electronic device that includes a main unit, a display unit, and a hinge mechanism having a first shaft for connecting the display unit to the main unit so as to be openable and closable, and a second shaft for connecting the display unit to the main unit so as to rotate the display unit horizontally relative to the main unit. Hollow leg sections of the display unit each have an engagement component accommodated therein. The engagement component has a shaft-like shape that has a regular octagonal cross-section. The engagement component is supported by a housing of the display unit. The display unit includes a pair of operation levers. The operation levers are each used for moving the engagement component to an engagement position or a disengagement position, according to an operator's manual operation. At the engagement position, the engagement component is moved into a recess of a brake shaft, and engages with an inner surface of the recess. The brake shaft is supported, by a bracket fixed to a casing of the main unit, so as to be rotatable. When the display unit is rotated from a closed position to an open position, the rotation of the display unit is conveyed to the brake shaft through the engagement component, and a torque for the rotation is divided so as to be applied to both the hinge mechanism and the brake shaft.

SUMMARY

The present disclosure is to make available an electronic device effective for reducing an external force applied to a display in a case where a projecting component of a first casing abuts against the display of a second casing when the electronic device is closed.

An electronic device of the present disclosure includes: a first casing; a second casing connected to the first casing such that the electronic device is openable and closable, the second casing having a display provided on a surface on the first casing side; a projecting component that projects from a top side surface of the first casing, and is positioned on the top side surface of the first casing at such a position as to abut against the display when the electronic device is closed; and a movable support section configured to support the projecting component so as to allow the projecting component to move relative to the first casing such that an amount of projection of the projecting component from the top side surface of the first casing is reduced when the projecting component is pushed by the display in the case of the electronic device being closed.

The electronic device of the present disclosure is effective for reducing an external force applied to the display in a case where the projecting component of the first casing abuts against the display of the second casing when the electronic device is closed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view illustrating a normally opened position of an electronic device according to a first embodiment;

FIG. **2** is a perspective view illustrating a state where a second casing is tilted in the course of switching between the normally opened position and an inversely opened position, in the electronic device according to the first embodiment;

FIG. **3** is a schematic diagram illustrating a range in which the second casing is allowed to rotate about an inverting axial-component in the first embodiment;

FIG. **4** illustrates a first support component of the electronic device according to the first embodiment;

FIG. **5** illustrates a second support component of the electronic device according to the first embodiment;

FIG. **6** is a cross-sectional view of a base end portion of the second casing, illustrating a function of a support assisting section exhibited when the second casing is rotated about the inverting axial-component in the electronic device according to the first embodiment;

FIG. **7** illustrates the second support component of the electronic device according to the first embodiment, as viewed from a rear side of a first casing;

FIG. **8** illustrates a state where the second support component of the electronic device according to the first embodiment is titled, as viewed from the rear side of the first casing;

FIG. **9** is a front view of an inner surface of a first support component of the electronic device according to a second embodiment; and

FIG. **10** illustrates a state where a first auxiliary axial-component is moved into or out of the first support component of the electronic device according to the second embodiment.

DETAILED DESCRIPTION

Hereinafter, embodiments will be described in detail with reference to the drawings as appropriate. However, there will be instances in which detailed description beyond what is necessary is omitted. For example, detailed description of subject matter that is previously well-known, as well as redundant description of components that are substantially the same will in some cases be omitted. This is to prevent the following description from being unnecessarily lengthy, in order to facilitate understanding by a person of ordinary skill in the art.

The inventors provide the following description and the accompanying drawings in order to allow a person of ordinary skill in the art to sufficiently understand the present disclosure, and the description and the drawings are not intended to restrict the subject matter of the scope of patent claims.

First Embodiment

Hereinafter, a first embodiment will be described with reference to FIGS. **1** to **8**.

[1-1. Entire Configuration of Electronic Device]

FIG. **1** is a perspective view illustrating a normally opened position of an electronic device **100** according to the present embodiment. FIG. **2** is a perspective view illustrating a state where a second casing **102** is tilted in the course of switching between the normally opened position and an inversely opened position, in the electronic device **100** according to the present embodiment.

As shown in FIG. **1**, the electronic device **100** of the present embodiment is a notebook computer which is one example of an information processing apparatus. The electronic device **100** includes a first casing **101** having an operation section **110** provided on a top surface **101***a*, the second casing **102** having a display **103** provided on a front surface **102***a*, and a

hinge mechanism **120** connecting a rear side portion of the first casing **101** to a lower side portion of the second casing **102**. The operation section **110** is structured so as to receive an operation from a user of the electronic device **100**, and is implemented as, for example, a keyboard, a touch pad, and a touch panel. The touch panel is disposed so as to overlap the display **103**.

In the following description, the hinge mechanism **120** side of the first casing **101** is referred to as "far side" or "rear side", and a side opposite thereto is referred to as "near side" or "front side". Further, a surface that extends in the front-rear direction, among the outer circumferential surfaces (the surfaces of the first casing **101** which extend in the thickness direction) of the first casing **101**, is referred to as "side surface".

As shown in FIG. **1** and FIG. **2**, the first casing **101** is a thin casing having a roughly rectangular shape as viewed in a planar manner. The first casing **101** has the top surface **101***a*, a back surface **101***b*, a front side end face **101***c*, a rear side end face **101***d*, a first side surface **101***e*, and a second side surface **101***f*. The first casing **101** has a CPU, a memory (for example, an HDD), a battery, and the like mounted therein (not shown). The keyboard and the touch pad of the operation section **110** as described above are provided on the top surface **101***a* of the first casing **101**. For example, a portion through which the battery is removed is provided on the back surface **101***b* of the first casing **101** (not shown). A connection terminal for an electrical cord, a connection port (for example, a USB port) for a peripheral device, and the like are provided on the rear side end face **101***d* of the first casing **101** (not shown).

As shown in FIG. **1** and FIG. **2**, the second casing **102** is a thin casing having a roughly rectangular shape as viewed in a planar manner. The second casing **102** has the front surface **102***a*, a back surface **102***b*, a base end face **102***c*, a top end face **102***d*, a first side surface **102***e*, and a second side surface **102***f*. The shape and size of the second casing **102** are almost the same as the shape and size of the first casing **101**, as viewed in the planar manner. In the second casing **102**, the display **103** occupies a large part of the front surface **102***a*. The display **103** of the second casing **102** is opposed to the keyboard of the first casing **101** in a closed state in which the first casing **101** and the second casing **102** are overlaid with each other. Hereinafter, the closed state where the first casing **101** is overlaid with the entirety of the second casing **102**, and the display **103** is opposed to the keyboard, is referred to as a normally closed position. In the second casing **102**, the back surface **102***b* opposite to the display **103** is a shield surface for protecting the electronic device **100**.

The second casing **102** has a first cut portion **111**, a second cut portion **112**, and a third cut portion **113** formed on a base end side (a lower side in FIG. **1**) on which the hinge mechanism **120** is connected. The first cut portion **111** is formed at one end (the right hand edge in FIG. **1**), on the base end side, of the second casing **102**. The second cut portion **112** is formed at the other end (the left hand edge in FIG. **1**), on the base end side, of the second casing **102**. The third cut portion **113** is formed at almost the center portion, on the base end side, of the second casing **102**.

Further, on the base end side of the second casing **102**, a first projecting case component **121** is provided between the first cut portion **111** and the third cut portion **113**, and a second projecting case component **122** is provided between the second cut portion **112** and the third cut portion **113**. The first projecting case component **121** and the second projecting case component **122** are each a case component that projects on the base end side of the second casing **102**, and that has a roughly rectangular parallelepiped shape. The first projecting case component **121** and the second projecting case component **122** form a part of the second casing **102**.

The hinge mechanism **120** is formed as a so-called two-axis hinge. The hinge mechanism **120** connects between the rear side portion of the first casing **101** and the base end side portion of the second casing **102** such that the electronic device **100** is openable and closable, and the second casing **102** is rotatable relative to the first casing **101** in a state where the electronic device **100** is opened, so as to switch between the normally opened position where the display **103** faces the first casing **101** side, and the inversely opened position where the display **103** faces a side opposite to the side which the display **103** faces in the normally opened position.

Specifically, the hinge mechanism **120** includes: a housing **125** that is disposed in the third cut portion **113** and has a roughly rectangular parallelepiped shape; opening and closing axial-components **126** and **127** for opening and closing the electronic device **100**; and an inverting axial-component **128** for inverting the second casing **102**, as shown in FIG. **1**. The opening and closing axial-components **126** and **127** are formed as two axial-components. The two opening and closing axial-components, **126** and **127**, are provided so as to be parallel to the base end face **102***c* of the second casing **102** and coaxial with each other. One of the opening and closing axial-components, **126** and **127**, that is, the opening and closing axial-component **126** in the present embodiment, has one end portion supported by an axial-component receiving section (not shown) in the housing **125** so as to be rotatable, and has the other end portion supported by an axial-component receiving section (not shown) in the first projecting case component **121** so as to be rotatable. The other of the opening and closing axial-components, **126** and **127**, that is, the opening and closing axial-component **127** in the present embodiment, has one end portion supported by an axial-component receiving section (not shown) in the housing **125** so as to be rotatable, and has the other end portion supported by an axial-component receiving section (not shown) in the second projecting case component **122** so as to be rotatable. The inverting axial-component **128** extends in the thickness direction of the first casing **101**. The inverting axial-component **128** has one end portion supported by an axial-component receiving section (not shown) in the housing **125**, so as to be rotatable, and the other end portion supported by an axial-component receiving section (not shown) in the first casing **101**, so as to be rotatable.

The electronic device **100** switches from the normally closed position to the normally opened position where a user is allowed to view the display **103**, by the second casing **102** pivoting about the opening and closing axial-components **126** and **127** and opening so as to move away from the front side portion of the first casing **101**. In the normally opened position, the display **103** faces the first casing **101** side. The electronic device **100** switches from the normally opened position to the inversely opened position where the display **103** faces a side opposite to the first casing **101** side, by the second casing **102** pivoting about the inverting axial-component **128** so as to rotate relative to the first casing **101**. The electronic device **100** switches from the inversely opened position to the inversely closed position where the electronic device **100** is closed with the display **103** facing the side opposite to the first casing **101** side, by the second casing **102** pivoting about the opening and closing axial-components **126** and **127** and closing so as to approach the front side portion of the first casing **101**. When the second casing **102** is moved in a direction opposite to the direction in which the normally closed position is changed to the inversely closed position, the electronic device **100** is returned from the inversely closed

position to the normally closed position through the inversely opened position and the normally opened position.

The hinge mechanism **120** is structured such that a range of directions in which the display **103** is allowed to face when switching between the normally opened position and the inversely opened position is being performed, is limited to almost half a range of the entire circumference around the inverting axial-component **128**. FIG. **3** is a schematic diagram illustrating a range in which the second casing **102** is allowed to rotate about the inverting axial-component **128**. Specifically, the hinge mechanism **120** is structured such that, in the course of the normally opened position being switched to the inversely opened position, the second casing **102** is allowed to rotate relative to the first casing **101** only in a first rotation direction (the clockwise direction as viewed from above the electronic device **100**) that causes the display **103** to face a second support component **152** described below, as shown in FIG. **3**(*a*). Further, the hinge mechanism **120** is structured such that, in the course of the inversely opened position being switched to the normally opened position, the second casing **102** is allowed to rotate relative to the first casing **101** only in a second rotation direction (the counterclockwise direction as viewed from above the electronic device **100**) opposite to the first rotation direction, as shown in FIG. **3**(*b*). The first rotation direction and the second rotation direction are each a direction of rotation about the inverting axial-component **128**.

Further, as shown in FIG. **2**, the hinge mechanism **120** is structured such that, also in the course of the switching between the normally opened position and the inversely opened position, the second casing **102** is allowed to rotate relative to the first casing **101** by pivoting about the opening and closing axial-components **126** and **127**.

[1-2. Structure of Support Assisting Section]

The electronic device **100** further includes a support assisting section **150** for assisting the hinge mechanism **120** in supporting the second casing **102**. The support assisting section **150** includes a first auxiliary axial-component **141**, a second auxiliary axial-component **142**, a first support component **151**, and the second support component **152**.

FIG. **4** illustrates the first support component **151** of the electronic device **100** according to the present embodiment. FIG. **4**(*a*) is a perspective view of the first support component **151** having the first auxiliary axial-component **141** fitted therein, FIG. **4**(*b*) is a perspective view of the first support component **151** which does not have the first auxiliary axial-component **141** fitted therein, and FIG. **4**(*c*) is a front view of an inner surface **151***a* of the first support component **151**. FIG. **5** illustrates the second support component **152** of the electronic device **100** according to the present embodiment. FIG. **5**(*a*) is a perspective view of the second support component **152** having the second auxiliary axial-component **142** fitted therein, FIG. **5**(*b*) is a perspective view of the second support component **152** which does not have the second auxiliary axial-component **142** fitted therein, and FIG. **5**(*c*) is a front view of an inner surface **152***a* of the second support component **152**.

The first auxiliary axial-component **141** projects on an outer side surface **121***a* of the first projecting case component **121** as shown in FIG. **4**(*a*). The first auxiliary axial-component **141** is formed as an axial-component having a flat top surface and having a roughly circular-cylindrical shape. Further, the second casing **102** having provided therein the first auxiliary axial-component **141** as the axial-component forms a casing having an axial-component. The first auxiliary axial-component **141** is disposed on an extended line of the axes of the opening and closing axial-components **126** and **127** as shown in FIG. **6**(*a*) indicated below. The first auxiliary axial-component **141** is coaxial with the opening and closing axial-components **126** and **127**. The first auxiliary axial-component **141** is fixed to the first projecting case component **121**. Therefore, if the top surface of the first auxiliary axial-component **141** is pushed toward the inner side of the first projecting case component **121**, the first auxiliary axial-component **141** does not move, and an amount of projection of the first auxiliary axial-component **141** is not changed.

The second auxiliary axial-component **142** projects on an outer side surface **122***a* of the second projecting case component **122** as shown in FIG. **5**(*a*). The second auxiliary axial-component **142** has a roughly circular-cylindrical shape and a top portion **142***a* which is rounded. The top portion **142***a* is formed in a semispherical shape. The second auxiliary axial-component **142** is disposed on an extended line of the axes of the opening and closing axial-components **126** and **127** as shown in FIG. **6**(*a*). The second auxiliary axial-component **142** is coaxial with the opening and closing axial-components **126** and **127**. The support assisting section **150** further includes an elastic component (for example, a coil spring) **165** for urging the second auxiliary axial-component **142** as shown in FIG. **5**(*a*). The elastic component **165** is a component for changing an amount of projection of the second auxiliary axial-component **142** from the outer side surface **122***a* of the second projecting case component **122**.

For example, the second projecting case component **122** has formed therein a mounting hole **122***b* in which the second auxiliary axial-component **142** and the elastic component **165** are mounted. The mounting hole **122***b* is open on the outer side surface **122***a*. The elastic component **165** has one end connected to a bottom surface of the mounting hole **122***b*, and has the other end connected to a base end face of the second auxiliary axial-component **142**. An edge portion around the mounting hole **122***b* projects slightly inward so as not to disengage the elastic component **165**. Further, even when an amount of projection of the second auxiliary axial-component **142** from the outer side surface **122***a* is maximum, the elastic component **165** is contracted, and pushes the second auxiliary axial-component **142** outward. In this state, the second auxiliary axial-component **142** is caught by the edge portion around the mounting hole **122***b*, and the second auxiliary axial-component **142** is not disengaged from the mounting hole **122***b*. When the top portion **142***a* of the second auxiliary axial-component **142** is pushed toward an inner side of the second projecting case component **122**, the contraction of the elastic component **165** is enhanced, to move the second auxiliary axial-component **142** inward (rightward in FIG. **5**(*a*)). When a force for pushing the top portion **142***a* of the second auxiliary axial-component **142** is removed, the elastic component **165** is extended, to return the second auxiliary axial-component **142** to an original position. An amount of projection of the second auxiliary axial-component **142** is changed according to a force applied to the top portion **142***a* of the second auxiliary axial-component **142**.

The first support component **151** is provided on one corner portion (the right far side corner portion in FIG. **1**) on the far side of the top surface **101***a* of the first casing **101**. The first support component **151** is a small projection having a rounded top portion as shown in FIG. **4**. The first support component **151** projects from the top surface **101***a* of the first casing **101**. The first support component **151** is fixed to the first casing **101**. The first support component **151** corresponds to a first axial-component receiving section having a recess **156** into which the first auxiliary axial-component **141** fits in

the normally opened position. The first support component **151** supports the first auxiliary axial-component **141** on a wall surface of the recess **156**.

The first support component **151** has the recess **156** formed, in almost a U-shape, on an inner surface **151***a* that is opposed to the outer side surface **121***a* of the first projecting case component **121** in the normally opened position, as shown in FIG. **4**(*c*). In the first support component **151**, the recess **156** is open on the front side thereof. The recess **156** includes an upper axial-component support wall **156***a*, a lower axial-component support wall **156***b*, and a rear side axial-component stop wall **156***c*, as shown in FIG. **4**(*b*). The upper axial-component support wall **156***a*, the lower axial-component support wall **156***b*, and the rear side axial-component stop wall **156***c* extend almost perpendicular to the bottom surface of the recess **156** through a haunch. In the first support component **151**, the axial-component stop wall **156***c* prevents passing of the first auxiliary axial-component **141**. The height (the height from the bottom surface of the recess **156** to the top end of the axial-component stop wall **156***c*) of the axial-component stop wall **156***c* is lower than the height of each of the axial-component support walls **156***a* and **156***b* paired, as shown in FIG. **4**(*b*). The height of the upper axial-component support wall **156***a* and the height of the lower axial-component support wall **156***b* are the same. Further, the height of the axial-component stop wall **156***c* of the first support component **151** is lower than the height of an axial-component stop wall **166***c* of the second support component **152** as described below.

Further, the first support component **151** includes a stopper **157** used for holding the first auxiliary axial-component **141** in the recess **156**. The stopper **157** includes an operation component **157***a* operated by a user, and a rod component **157***b* integrated with the operation component **157***a*, as shown in FIG. **4**(*b*).

The operation component **157***a* has a plate-like shape having a rounded upper front side portion. The operation component **157***a* is provided in a mounting space **158** formed in the first support component **151**. The mounting space **158** is adjacent to the recess **156** via a separation wall **159**. The mounting space **158** has an opening at the front surface of the first support component **151**. Through the opening, the operation component **157***a* slightly projects.

On the other hand, the rod component **157***b* has a rod-like shape having a roughly rectangular cross-section. The rod component **157***b* is inserted into a through hole **159***a* formed in the separation wall **159**. The rod component **157***b* has one end connected to a surface, on the separation wall **159** side, of the operation component **157***a*.

When the stopper **157** is slid in the axial direction of the rod component **157***b* by a user, switching is performed between a projecting state in which the rod component **157***b* projects from the bottom surface of the recess **156** to prevent the first auxiliary axial-component **141** from passing through the open side portion of the recess **156**, and a non-projecting state in which the rod component **157***b* does not project from the bottom surface of the recess **156**. The through hole **159***a* formed in the separation wall **159** is positioned so as to accommodate the first auxiliary axial-component **141** between the rod component **157***b* and the axial-component stop wall **156***c* in the projecting state. Therefore, the non-projecting state can be switched to the projecting state in a state where the first auxiliary axial-component **141** abuts against the axial-component stop wall **156***c*. In the projecting state, the first auxiliary axial-component **141** is held in the recess **156** by the stopper **157**. When the projecting state is switched to the non-projecting state, a state where the first auxiliary axial-component **141** is held in the recess **156** by the stopper **157** is cancelled, and the first auxiliary axial-component **141** is allowed to pass through the open side portion of the recess **156**.

The second support component **152** is provided on the other corner portion (the left far side corner portion in FIG. **1**) on the far side of the top surface **101***a* of the first casing **101**. The second support component **152** is provided in the first casing **101** on the side opposite to the first support component **151** side so as to sandwich the hinge mechanism **120**. The second support component **152** is a small projection having a rounded top portion as shown in FIG. **5**. The second support component **152** projects from the top surface **101***a* of the first casing **101**. The second support component **152** is formed as a second axial-component receiving section having formed therein a recess **166** into which the first auxiliary axial-component **141** fits in the inversely opened position. Further, the second support component **152** forms a part of a movable component **181** described below.

As shown in FIG. **5**(*c*), the second support component **152** has the recess **166** formed, in almost a U-shape, on the inner surface **152***a* that is opposed to the outer side surface **122***a* of the second projecting case component **122** in the normally opened position. In the second support component **152**, the recess **166** is open on the front side thereof. The recess **166** includes an upper axial-component support wall **166***a*, a lower axial-component support wall **166***b*, and a rear side axial-component stop wall **166***c*. The upper axial-component support wall **166***a*, the lower axial-component support wall **166***b*, and the rear side axial-component stop wall **166***c* extend almost perpendicular to the bottom surface of the recess **166** through a haunch. In the second support component **152**, the axial-component stop wall **166***c* prevents passing of the first auxiliary axial-component **141**. The height (the height from the bottom surface of the recess **166** to the top end of the axial-component stop wall **166***c*) of the axial-component stop wall **166***c* is the same as the height of each of the upper axial-component support wall **166***a* and the lower axial-component support wall **166***b* as shown in FIG. **5**(*b*).

[1-3. Function, Effect, and the Like of Support Assisting Section]

A function, an effect, and the like of the support assisting section **150** in opening and closing the electronic device **100** will be described.

Firstly, an exemplary case where the support assisting section **150** is not included in the electronic device **100** is assumed and described for comparison with the present embodiment. The second casing **102** is supported by the first casing **101** via the hinge mechanism **120**. The hinge mechanism **120** is connected to the center portion, on the base end side, of the second casing **102**. Therefore, in a case where the electronic device **100** is in the normally opened position or the inversely opened position, unless the support assisting section **150** is provided, the second casing **102** is likely to pivot about the hinge mechanism **120** and tilt leftward or rightward. If the second casing **102** tilts leftward or rightward, a relatively heavy load may be applied to the hinge mechanism **120**.

On the other hand, in the present embodiment, the first auxiliary axial-component **141** having an amount of projection unchanged, the first support component **151** having formed therein the recess **156** into which the first auxiliary axial-component **141** fits in the normally opened position, and the second support component **152** having formed therein the recess **166** into which the first auxiliary axial-component **141** fits in the inversely opened position, are provided. In a state where the first auxiliary axial-component **141** fits into the recess **156** (or the recess **166**), the first auxiliary axial-

component **141** abuts against the upper axial-component support wall **156***a* (or the upper axial-component support wall **166***a*), and the first auxiliary axial-component **141** abuts against the lower axial-component support wall **156***b* (or the lower axial-component support wall **166***b*). A small gap may be formed between the first auxiliary axial-component **141** and the upper axial-component support wall **156***a* (or the upper axial-component support wall **166***a*), and a small gap may be formed between the first auxiliary axial-component **141** and the lower axial-component support wall **156***b* (or the lower axial-component support wall **166***b*).

Therefore, in the normally opened position, the lower axial-component support wall **156***b* of the first support component **151** abuts against the first auxiliary axial-component **141** to prevent the second casing **102** from pivoting about the hinge mechanism **120** and tilting rightward in FIG. **1**, and the upper axial-component support wall **156***a* of the first support component **151** abuts against the first auxiliary axial-component **141** to prevent the second casing **102** from pivoting about the hinge mechanism **120** and tilting leftward in FIG. **1**. The first auxiliary axial-component **141** is supported by the wall surfaces of the recess **156** of the first support component **151**. "Tilting the second casing **102** leftward (or rightward)" represents "titling the second casing **102** so as to be lowered leftward (or rightward)".

On the other hand, in the inversely opened position, the upper axial-component support wall **166***a* of the second support component **152** abuts against the first auxiliary axial-component **141** to prevent the second casing **102** from pivoting about the hinge mechanism **120** and tilting rightward, and the lower axial-component support wall **166***b* of the second support component **152** abuts against the first auxiliary axial-component **141** to prevent the second casing **102** from pivoting about the hinge mechanism **120** and tilting leftward. The first auxiliary axial-component **141** is supported by the wall surfaces of the recess **166** of the second support component **152**.

Further, in the present embodiment, the second auxiliary axial-component **142** is also provided. The second auxiliary axial-component **142** is formed as a projection component that fits into the recess **166** of the second support component **152** in the normally opened position, and fits into the recess **156** of the first support component **151** in the inversely opened position. Therefore, in the normally opened position, the upper axial-component support wall **166***a* and the lower axial-component support wall **166***b* of the second support component **152** abut against the second auxiliary axial-component **142** to prevent the second casing **102** from pivoting about the hinge mechanism **120** and tilting leftward and rightward. On the other hand, in the inversely opened position, the upper axial-component support wall **156***a* and the lower axial-component support wall **156***b* of the first support component **151** abut against the second auxiliary axial-component **142** to prevent the second casing **102** from pivoting about the hinge mechanism **120** and tilting leftward and rightward.

As described above, according to the present embodiment, the support assisting section **150** assists in supporting the second casing **102** when the electronic device **100** is opened and closed, and the second casing **102** can be supported at three sections, that is, the hinge mechanism **120**, the first support component **151**, and the second support component **152**. Therefore, the second casing **102** can be restrained from tilting leftward and rightward when the electronic device **100** is opened and closed.

Further, when the stopper **157** is put into the projecting state in the normally opened position, the rotation of the second casing **102** about the inverting axial-component **128** can be inhibited. Therefore, the second casing **102** can be stably supported when the normally opened position is switched to the normally closed position.

Subsequently, the function, the effect, and the like of the support assisting section **150** in rotating the second casing **102** about the inverting axial-component **128** will be described. FIG. **6** is a cross-sectional view of the base end portion of the second casing **102**, illustrating a function of the support assisting section **150** exhibited when the second casing **102** is rotated about the inverting axial-component **128**. FIG. **6**(*a*) is a cross-sectional view illustrating the normally opened position, FIG. **6**(*b*) is a cross-sectional view illustrating a state where the second casing **102** is rotated clockwise by five degrees from the normally opened position, FIG. **6**(*c*) is a cross-sectional view illustrating a state where the second casing **102** is rotated clockwise by ten degrees from the normally opened position, FIG. **6**(*d*) is a cross-sectional view illustrating a state where the second casing **102** is rotated clockwise by 175 degrees from the normally opened position, and FIG. **6**(*e*) is a cross-sectional view illustrating a state (that is, the inversely opened position) where the second casing **102** is rotated clockwise by 180 degrees from the normally opened position.

As shown in FIG. **6**(*a*), the first auxiliary axial-component **141** fits into the recess **156** of the first support component **151**, and the second auxiliary axial-component **142** fits into the recess **166** of the second support component **152**, in the normally opened position. In FIG. **6**(*a*), the stopper **157** is in the projecting state. If rotation of the second casing **102** about the inverting axial-component **128** is attempted, the first auxiliary axial-component **141** is caught by the rod component **157***b* of the stopper **157**, and the second casing **102** cannot be rotated. When a user operates the stopper **157** so as to be put into the projecting state in the normally opened position, an unintended rotation of the second casing **102** can be prevented.

When the user switches the stopper **157** to the non-projecting state in the normally opened position, the second casing **102** is allowed to rotate. When the second casing **102** is rotated slightly from the normally opened position, the first auxiliary axial-component **141** passes through the open side portion of the recess **156** of the first support component **151** as shown in FIG. **6**(*b*). On the other hand, the top portion **142***a* of the second auxiliary axial-component **142** abuts against and is pushed by the axial-component stop wall **166***c* of the second support component **152**. As a result, the elastic component **165** is contracted, and an amount of projection of the second auxiliary axial-component **142** is reduced. Thus, the second auxiliary axial-component **142** is allowed to pass by the axial-component stop wall **166***c*. When the second auxiliary axial-component **142** has passed by the axial-component stop wall **166***c*, the elastic component **165** is extended and an amount of projection of the second auxiliary axial-component **142** is restored as shown in FIG. **6**(*c*). Thus, the second auxiliary axial-component **142** is disengaged from the recess **166** of the second support component **152**.

As shown in FIG. **6**(*d*), since the recess **166** of the second support component **152** is open on the front side, the first auxiliary axial-component **141** passes through the open side portion of the recess **166** of the second support component **152**, and fits into the recess **166**. On the other hand, the top portion **142***a* of the second auxiliary axial-component **142** abuts against and is pushed by the axial-component stop wall **156***c* of the first support component **151** immediately before fitting into the recess **156** of the first support component **151**. As a result, the elastic component **165** is contracted, and an amount of projection of the second auxiliary axial-compo-

nent **142** is reduced. Thus, the second auxiliary axial-component **142** is allowed to pass by the axial-component stop wall **156***c*. When the second auxiliary axial-component **142** has passed by the axial-component stop wall **156***c* and fits into the recess **156**, the elastic component **165** is extended, and an amount of projection of the second auxiliary axial-component **142** is restored as shown FIG. **6**(*e*).

As described above, the second casing **102** can be rotated about the inverting axial-component **128** relative to the first casing **101**, to move the first auxiliary axial-component **141** into or out of the recesses **156** and **166** through the open end portions of the recesses **156** and **166**. Further, the second auxiliary axial-component **142** can be caused to pass by the axial-component stop walls **156***c* and **166***c* with an amount of projection of the second auxiliary axial-component **142** being changed, thereby enabling the second auxiliary axial-component **142** to move into or out of the recesses **156** and **166**.

Further, since the first auxiliary axial-component **141** is fixed to the second casing **102**, an amount of projection of the first auxiliary axial-component **141** is constant. Therefore, the first auxiliary axial-component **141** can be supported by the first support component **151** with enhanced stability in the normally opened position, and the first auxiliary axial-component **141** can be supported by the second support component **152** with enhanced stability in the inversely opened position.

Further, since an amount of projection of the second auxiliary axial-component **142** is changed by means of the elastic component **165**, the second auxiliary axial-component **142** can be smoothly moved into or out of the recesses **156** and **166** regardless of the support components **151** and **152** having provided therein the axial-component stop walls **156***c* and **166***c* for preventing passing of the first auxiliary axial-component **141**. In the present embodiment, since the top portion **142***a* of the second auxiliary axial-component **142**, which is rounded, abuts against the axial-component stop walls **156***c* and **166***c*, the second auxiliary axial-component **142** can be smoothly moved into or out of the recesses **156** and **166**. Further, in the first support component **151**, since the height of the axial-component stop wall **156***c* is lower than the height of each of the axial-component support walls **156***a* and **156***b*, the second auxiliary axial-component **142** can be smoothly moved into or out of the recess **156**.

Further, when the second auxiliary axial-component **142** fits into the recess **156** or **166**, a user can feel that an amount of the projection of the second auxiliary axial-component **142** is restored, and the user can recognize that the switching between the normally opened position and the inversely opened position has been ended. In particular, the height of the axial-component stop wall **156***c* of the first support component **151** is lower than the height of the axial-component stop wall **166***c* of the second support component **152**. Therefore, the user can experience a different feeling between the switching to the normally opened position and the switching to the inversely opened position.

Further, in the support components **151** and **152**, among the front side portion and the rear side portion of each of the recesses **156** and **166**, the portion through which the first auxiliary axial-component **141** passes when the second casing **102** is rotated in a direction in which the rotation is allowed, is opened, and the axial-component stop walls **156***c* and **166***c* are formed on the sides opposite to the open sides. Therefore, the second casing **102** can be prevented from rotating beyond a rotation range of the second casing **102** which is set for the hinge mechanism **120**.

[1-4. Structure of Movable Support Section]

The electronic device **100** further includes a movable support section **170** for supporting the second support component **152** so as to be movable relative to the first casing **101** such that, when the second support component **152** is pushed by the display **103**, an amount of projection of the second support component **152** from the top surface **101***a* of the first casing **101** is reduced, as shown in FIG. **5**(*c*). The second support component **152** is positioned, on the top surface **101***a* of the first casing **101**, at such a position as to abut against the display **103** only when the electronic device **100** is closed in the course of switching between the normally opened position and the inversely opened position. The second support component **152** supports not the opening and closing axial-components **126** and **127** of the hinge mechanism **120**, but the first auxiliary axial-component **141** and the second auxiliary axial-component **142** as an axial-component for opening and closing the electronic device **100**, as described above. The opening and closing axial-components **126** and **127** act as a main axial-component, and the first auxiliary axial-component **141** and the second auxiliary axial-component **142** act as an auxiliary axial-component.

FIG. **7** illustrates the second support component **152** of the electronic device **100** of the present embodiment, as viewed from the rear side of the first casing **101**. FIG. **8** illustrates a state where the second support component **152** of the electronic device **100** according to the present embodiment is tilted, as viewed from the rear side of the first casing **101**.

As shown in FIG. **5**(*c*), the movable support section **170** includes: a support axial-component **171** for rotating the second support component **152** relative to the first casing **101**; an axial-component receiving section **174** for supporting the support axial-component **171** provided in the first casing **101**, so as to allow the support axial-component **171** to rotate; and an elastic component **172** for restoring a position of the second support component **152** which has been pushed by the display **103** and pivoted about the support axial-component **171**.

The support axial-component **171** is formed in a circular cylindrical shape. The support axial-component **171** extends in the front-rear direction of the first casing **101**. As shown in FIG. **7**, a pivot of the support axial-component **171** is positioned, in the first casing **101**, inward of a position in the second support component **152** at which the second support component **152** abuts against the display **103**, in the left-right direction of the first casing **101**. Further, the pivot of the support axial-component **171** is below a lower end of a corner component **175** described below, in the up-down direction of the first casing **101**.

On the other hand, the elastic component **172** is implemented as a torsion spring. The elastic component **172** includes: a coil section **172***a*, formed as a coil-like component, through which the support axial-component **171** penetrates; a first rod section **172***b* that extends from one end of the coil section **172***a* in almost a tangential direction; and a second rod section **172***c* that extends from the other end of the coil section **172***a* in almost a tangential direction, as shown in FIG. **5**(*c*). In the elastic component **172** in the state shown in FIG. **7** (a state where the second support component **152** is not tilted), in a state where the coil section **172***a* is supported by the support axial-component **171**, the first rod section **172***b* is pushed by a connection component **176** described below, and the second rod section **172***c* is pushed by a bottom surface of a fitting groove **188***a* of a leg section **188**.

The second support component **152** forms a part of the movable component **181** that is supported so as to be movable relative to the first casing **101**. The movable component **181** is

supported so as to be movable relative to the first casing **101** through a fixed component **182** fixed to the first casing **101**.

As shown in FIG. **7**, the movable component **181** is a component in which the second support component **152**, the corner component **175** provided below the second support component **152**, and the connection component **176** for connecting to the fixed component **182** are integrated with each other. The corner component **175** is integrated with the lower end of the second support component **152**. Further, the connection component **176** is integrated with an inner surface of the corner component **175**. The connection component **176** extends diagonally downward from the inner surface of the corner component **175**. The first rod section **172***b* of the elastic component **172** is fixed to an inner surface of the connection component **176**. A through hole **176***a* into which the support axial-component **171** is inserted is formed at an end portion of the connection component **176**, as shown in FIG. **5**(*c*). Both ends of the support axial-component **171** which is inserted into the through hole **176***a* are fitted into the axial-component receiving section **174** of the fixed component **182**, thereby connecting the movable component **181** to the fixed component **182**.

On the other hand, the fixed component **182** includes: a body section **187** which is roughly L-shaped as viewed in a planar manner: and the leg section **188** integrated with a lower portion of the body section **187**. As shown in FIG. **5**(*b*), a cut portion **185** is formed at a corner portion (the left far side corner portion in FIG. **1**), on the far side, of the first casing **101**. The fixed component **182** is fixed to the first casing **101** by means of screws and the like in a state where the body section **187** is fitted into the cut portion **185**. In this state, a cut portion **186** into which the movable component **181** is fitted is formed outside the body section **187** which is almost L-shaped as viewed in a planar manner.

As shown in FIG. **5**(*c*), the body section **187** has formed therein the axial-component receiving section **174** for supporting the support axial-component **171** so as to allow the support axial-component **171** to rotate. The axial-component receiving section **174** includes: a first axial-component receiving section **174***a* formed in an inner surface of a portion, in the body section **187**, forming a part of the rear side end face **101***d* of the first casing **101**; and a second-axial-component receiving section **174***b* opposed to the first axial-component receiving section **174***a*. The first axial-component receiving section **174***a* and the second axial-component receiving section **174***b* are opposed to each other in the front-rear direction of the first casing **101**.

The leg section **188** projects from the back surface **101***b* of the electronic device **100** as shown in FIG. **5**(*c*). On the upper end in the inner surface of the leg section **188**, the fitting groove **188***a* into which the second rod section **172***c* of the elastic component **172** is fitted, is formed. The second rod section **172***c* is supported by the bottom surface of the fitting groove **188***a*. On the far side of the first casing **101**, the leg section **188** is also provided at a position opposite to the first support component **151** on the side reverse of the first support component **151** side (the right far side corner portion in FIG. **1**) (not shown).

[1-5. Function, Effect, and the Like of Movable Support Section]

In the movable support section **170**, the support axial-component **171** is provided along the front-rear direction of the first casing **101**. The support axial-component **171** is supported by a pair of the first axial-component receiving section **174***a* and the second axial-component receiving section **174***b*, so as to be rotatable. In this state, in a case where the electronic device **100** is closed in the course of switching between the normally opened position and the inversely opened position as shown in FIG. **2**, the display **103** on the front surface **102***a* of the second casing **102** abuts against the top end of the second support component **152**. When the second support component **152** is pushed downward by the display **103**, the second support component **152** pivots about the support axial-component **171** to rotate outward of the first casing **101**, and the second support component **152** is tilted outward of the first casing **101**, as shown in FIG. **8**(*a*).

When the second casing **102** is further tilted from the position shown in FIG. **8**(*a*) so as to approach the first casing **101**, the second support component **152** is further pushed, and the second support component **152** is further rotated by pivoting about the support axial-component **171**. The second support component **152** can pivot about the support axial-component **171** to rotate to a limit position at which the lower end of the corner component **175** abuts against the outer surface of the leg component **188**, as shown in FIG. **8**(*b*). The top end portion of the second support component **152** having been rotated to the limit position is almost level with the top surface **101***a* of the first casing **101**. In the present embodiment, an amount of projection of the second support component **152** continues to be successively reduced until the front surface **102***a* of the second casing **102** abuts against the top surface **101***a* of the first casing **101**.

According to the present embodiment, even if the second support component **152** abuts against the display **103** in a case where the electronic device **100** is closed in the course of switching between the normally opened position and the inversely opened position, an amount of projection of the second support component **152** is reduced. Therefore, an external force applied from the second support component **152** to the display **103** can be reduced.

In a case where, as in the present embodiment, a direction in which the second casing **102** rotates relative to the first casing **101** is uniquely set, a portion against which the display **103** is likely to abut in the course of switching between the normally opened position and the inversely opened position, is limited. In such a case, even in a case where components that project from the top surface **101***a* of the first casing **101** function in conjunction with each other, only the component against which the display **103** is likely to abut may be movable so as to reduce an amount of projection. Specifically, in the present embodiment, although the display **103** is likely to abut against the second support component **152** in the course of switching between the normally opened position and the inversely opened position, the display **103** may not abut against the first support component **151**. This is because the first auxiliary axial-component **141** is restrained from moving in the far side direction, by means of the wall surface of the recess **156**. Therefore, in the present embodiment, the first support component **151** is fixed to the first casing **101** so as not to be movable. Also in this case, when the display **103** faces the far side, the back surface **102***b* of the display **103** may abut against the first support component **151** by the display **103** being titled toward the near side. However, in general, the display **103** is more fragile than the back surface **102***b*, and it is significant to protect the display **103** as an electronic component. On the other hand, the back surface **102***b* is likely to be hard and resistant to the abutment of the first support component **151**.

Further, the second support component **152** rotates outward of the first casing **101** by pivoting about the support axial-component **171**. The pivot of the support axial-component **171** is positioned, in the first casing **101**, inward of a position in the second support component **152** at which the second support component **152** abuts against the display **103**.

Therefore, the second support component **152** can be smoothly rotated outward of the first casing **101** due to a load applied from the display **103** to the second support component **152**.

Further, when the display **103** is moved away from the second support component **152**, the second support component **152** is returned, due to a restoring force of the elastic component **172**, to a non-pushed position in which the second support component **152** is not pushed by the display **103**. Therefore, a user is allowed to omit an operation for returning the second support component **152** to the non-pushed position.

[1-6. Summary of the First Embodiment]

In the present embodiment, the movable support section **170** is provided which supports the second support component **152** so as to be movable relative to the first casing **101** such that an amount of projection of the second support component **152** from the top surface **101***a* of the first casing **101** is reduced when the second support component **152** (projecting component) is pushed by the display **103** in a case where the electronic device **100** is closed. Therefore, an amount of projection of the second support component **152** is reduced according to the display **103** being tilted after the display **103** has abutted against the second support component **152**. Therefore, an external force applied from the second support component **152** to the display **103** can be reduced as compared to in a case where an amount of projection of the second support component **152** is not changed.

Further, in the present embodiment, the second support component **152** is positioned on the top surface **101***a* of the first casing **101**, at such a position as to abut against the display **103** in a case where the electronic device **100** is closed in the course of switching between the normally opened position and the inversely opened position. Therefore, even if the electronic device **100** is unintentionally closed in the course of switching between the normally opened position and the inversely opened position, application of a great external force from the second support component **152** to the display **103** can be prevented.

Furthermore, in the present embodiment, the second support component **152** supports the axial-components **141** and **142** used when the electronic device **100** is opened and closed, so as to allow the axial-components **141** and **142** to rotate. Therefore, with application of a great external force from the second support component **152** to the display **103** being prevented, the electronic device **100** can be stably opened and closed by means of the second support component **152**.

Moreover, in the present embodiment, the hinge mechanism **120** has the opening and closing axial-components **126** and **127** (main axial-component) used when the electronic device **100** is opened and closed. In the second casing **102** and the second support component **152**, the second casing **102** includes the auxiliary axial-components **141** and **142** (auxiliary axial-component) that are positioned on an extended line of the opening and closing axial-components **126** and **127** in the normally opened position and that are used when the electronic device **100** is opened and closed, and the second support component **152** supports the auxiliary axial-component so as to allow the auxiliary axial-component to rotate when the electronic device **100** is opened and closed. For opening and closing the electronic device **100**, not only the opening and closing axial-components **126** and **127** of the hinge mechanism **120**, but also the auxiliary axial-components **141** and **142** are used. The auxiliary axial-components **141** and **142** are supported by the second support component **152** so as to be rotatable. Therefore, the electronic device **100** can be stably opened and closed as compared to in a case where the electronic device **100** is opened and closed simply by means of the opening and closing axial-components **126** and **127**.

Furthermore, in the present embodiment, the hinge mechanism **120** connects the rear side portion of the first casing **101** to the second casing **102**. The second support component **152** is provided at the corner portion, on the rear side, of the first casing **101**. The movable support section **170** pivots about the support axial-component **171** that is rotatably supported by the first casing **101**, and that extends in the front-rear direction of the first casing **101**, and supports the second support component **152** so as to allow the second support component **152** to rotate outward of the first casing **101**. The second support component **152** pivots about the support axial-component **171** to rotate outward of the first casing **101**. In the present embodiment, since the second support component **152** is provided at the corner portion, on the rear side, of the first casing **101**, a force with which the display **103** pushes the second support component **152** in the case of the display **103** abutting against the second support component **152**, contains components in the left-right direction orthogonal to the front-rear direction of the first casing **101**. Therefore, the second support component **152** can be smoothly rotated outward of the first casing **101**.

Further, in the present embodiment, the pivot of the support axial-component **171** is positioned, in the first casing **101**, inward of a position in the second support component **152** at which the second support component **152** abuts against the display **103**. Therefore, the second support component **152** can be smoothly rotated outward of the first casing **101** due to a load applied from the display **103** to the second support component **152**.

Further, in the present embodiment, the movable support section **170** includes the elastic component **172** for restoring a position of the second support component **152** which has been pushed by the display **103** and moved. Therefore, when the display **103** is moved away from the second support component **152**, the second support component **152** is returned to a non-pushed position in which the second support component **152** is not pushed by the display **103**, due to a restoring force of the elastic component **172**. Therefore, a user is allowed to omit an operation of returning the second support component **152** to the non-pushed position.

Further, in the present embodiment, the first casing **101** includes the leg component **188** that projects from the back surface **101***b* of the first casing **101** at an opposite position on a side reverse of the second support component **152** side. The second support component **152** is integrated with the corner component **175** that forms the corner portion of the outer circumferential surface of the first casing **101**. The second support component **152** can pivot about the support axial-component **171** to rotate to a limit position at which the lower end of the corner component **175** abuts against the outer surface of the leg component **188**. The top end portion of the second support component **152** which has been rotated to the limit position is almost level with the top surface **101***a* of the first casing **101**. In the present embodiment, with the leg component **188** being provided, an amount of projection of the second support component **152** can be sufficiently reduced.

Further, in the present embodiment, the second casing **102** is provided with the first auxiliary axial-component **141** (auxiliary axial-component), and the second support component **152** supports, in the inversely opened position, the first auxiliary axial-component **141** so as to allow the first auxiliary axial-component **141** to rotate. The first support component

151 (axial-component receiving section) for supporting, in the normally opened position, the first auxiliary axial-component 141 so as to allow the first auxiliary axial-component 141 to rotate, is fixed to the first casing 101. The hinge mechanism 120 is structured such that the second casing 102 can be rotated relative to the first casing 101 only in the first rotation direction that causes the display 103 to face the second support component 152 in the course of the normally opened position being switched to the inversely opened position, and the second casing 102 can be rotated relative to the first casing 101 only in the second rotation direction opposite to the first rotation direction in the course of the inversely opened position being switched to the normally opened position. In the present embodiment, in the course of switching between the normally opened position and the inversely opened position, the display 103 does not face the first support component 151, and the first support component 151 that does not abut against the display 103 is fixed to the first casing 101. Therefore, in the normally opened position, the auxiliary axial-component 141 can be stably supported by the first support component 151.

Second Embodiment

Hereinafter, a second embodiment will be described with reference to FIG. 9 and FIG. 10. The second embodiment is different from the first embodiment in shape of the recess 156 of the first support component 151 and shape of the recess 166 of the second support component 152. In the second embodiment, the shape of the recess 156 of the first support component 151 and the shape of the recess 166 of the second support component 152 are the same. Hereinafter, the recess 156 of the first support component 151 will be described. Similarly to the first embodiment, the first support component 151 is fixed to the first casing 101, and the second support component 152 is supported so as to be movable relative to the first casing 101, by the movable support section 170.

Further, the second embodiment is different from the first embodiment in shape of a fitting section 240 of the first auxiliary axial-component 141 which fits into the recesses 156 and 166 and shape of a fitting section of the second auxiliary axial-component 142 which fits into the recesses 156 and 166. In the second embodiment, the shape of the fitting section 240 of the first auxiliary axial-component 141 and the shape of the fitting section of the second auxiliary axial-component 142 are the same. Hereinafter, the shape of the fitting section 240 of the first auxiliary axial-component 141 will be described.

FIG. 9 is a front view of an inner surface of the first support component 151 of the electronic device according to the present embodiment. FIG. 10 illustrates a state where the first auxiliary axial-component 141 is moved into or out of the first support component 151 of the electronic device 100 according to the present embodiment.

As shown in FIG. 9, the recess 156 of the first support component 151 is formed as a groove that extends in the front-rear direction from an inlet/outlet through which the first auxiliary axial-component 141 is moved into or out of the recess 156. The first support component 151 has formed therein a reduced-width section 271 in which the recess 156 has a narrow groove width, and an increased-width section 272 that is positioned in the recess 156 inward of the reduced-width section 271 and that has a groove width of the recess 156 increased as compared to the reduced-width section 271. The increased-width section 272 is formed by side walls of the recess 156 being each cut at almost the center portion thereof so as to be roughly D-shaped. In the first support component 151, the recess 156 is open on both the front side and the rear side thereof. As shown in FIG. 10(*a*), the fitting section 240 of the first auxiliary axial-component 141 which fits into the recess 156 has a cross-sectional shape of which the length in the width direction of the recess 156 is changed when the first auxiliary axial-component 141 is rotated about its axial center. Specifically, the fitting section 240 has a roughly elliptical cross-sectional shape. In the fitting section 240, a length L1, in a first direction, which passes through the axial center of the first auxiliary axial-component 141 is smaller than a groove width W1 of the reduced-width section 271, and a length L2, in a second direction orthogonal to the first direction, which passes through the axial center of the first auxiliary axial-component 141 is greater than the groove width W1 of the reduced-width section 271, and is smaller than a groove width W2 of the increased-width section 272.

As shown in FIG. 10(*a*), when the first auxiliary axial-component 141 is moved into or out of the recess 156, an orientation of the fitting section 240 is set such that the second direction of the fitting section 240 is the same as a direction (the front-rear direction of the first casing 101) in which the recess 156 extends. As a result, the fitting section 240 is put into a passing-allowed state in which the length L1 in the width direction of the recess 156 is smaller than the groove width W1 of the reduced-width section 271, and the fitting section 240 passes through the reduced-width section 271 of the recess 156. As shown in FIG. 10(*b*), when the second casing 102 pivots about the opening and closing axial-components 126 and 127 in a state where the fitting section 240 is positioned in the increased-width section 272 of the recess 156, the first auxiliary axial-component 141 is rotated to rotate the fitting section 240 in the increased-width section 272. As a result, the fitting section 240 is put into a passing-unallowed state in which a length L' in the width direction of the recess 156 is greater than the groove width W1 of the reduced-width section 271, and is smaller than the groove width W2 of the increased-width section 272. Thus, the fitting section 240 is held in the increased-width section 272.

In the present embodiment, a structure of the support assisting section 150 for assisting the hinge mechanism 120 in supporting the second casing 102 can be simplified. Further, since the fitting section 240 is held in the increased-width section 272 of the recess 156, the first auxiliary axial-component 141 can be stably held.

Although, in the present embodiment, the first auxiliary axial-component 141 rotates in conjunction with the second casing 102 pivoting about the opening and closing axial-components 126 and 127, a mechanism may be provided for automatically rotating the first auxiliary axial-component 141 when the first auxiliary axial-component 141 reaches the increased-width section 272.

[Summary of the Second Embodiment]

In the present embodiment, the movable support section 170 is provided which supports the second support component 152 so as to be movable relative to the first casing 101 such that an amount of projection of the second support component 152 from the top surface 101*a* of the first casing 101 is reduced when the second support component 152 (projecting component) is pushed by the display 103 in the case of the electronic device 100 being closed. Therefore, an external force applied from the second support component 152 to the display 103 can be reduced as compared to in a case where an amount of projection of the second support component 152 is not changed.

Other Embodiments

As described above, the first and the second embodiments have been descried above as examples of the technology

disclosed in the present application. However, the technology according to the present disclosure is not limited to these embodiments, and is also applicable to other embodiments realized by modifications, replacements, additions, and omissions as appropriate. Furthermore, another embodiment can be realized by combining the components described in the first and the second embodiments.

Hereinafter, other exemplary embodiments will be described.

In the first and the second embodiments, a notebook computer is described as an example of the electronic device **100**. However, the electronic device **100** may be, for example, foldable mobile telephone terminals, foldable electronic game machines, and foldable electronic dictionary terminals. The electronic device may be a device that includes the hinge mechanism **120** having the opening and closing axial-component.

Further, although, in the first and the second embodiments, the movable support section **170** supports the second support component **152** so as to allow the second support component **152** to rotate outward of the first casing **101**, the second support component **152** may be supported so as to be movable in the thickness direction of the first casing **101**.

Furthermore, although, in the first and the second embodiments, the movable support section **170** includes the elastic component **172** for restoring a position of the second support component **152** which has been pushed by the display **103** and moved, the movable support section **170** may not include the elastic component **172**. When the movable support section **170** does not include the elastic component **172**, a position of the second support component **152** which has been pushed by the display **103** and moved is restored by a user.

Further, although, in the first and the second embodiments, the second support component **152** is supported by the movable support section **170** so as to be movable, another projecting component positioned at such a position as to abut against the display **103** in a case where the electronic device **100** is closed, may be supported so as to be movable such that an amount of projection of the projecting component from the top surface **101***a* of the first casing **101** is reduced when the projecting component is pushed by the display **103**. Such a projecting component may be a component (for example, a track pointer used for moving a pointer (for example, an arrow) on a screen) that projects in a region, on the top surface **101***a* of the first casing **101**, in which a keyboard is provided. In this case, the hinge mechanism **120** may be structured such that the second casing **102** cannot rotate relative to the first casing **101** in a state where the electronic device **100** is opened. Further, in a case where the second casing **102** can be rotated, in the normally opened position, counterclockwise as viewed from above the electronic device **100**, the first support component **151** may be supported, as such a projecting component, so as to be movable.

Further, although, in the first and the second embodiments, the first support component **151** and the second support component **152** are provided in the first casing **101** and the first auxiliary axial-component **141** and the second auxiliary axial-component **142** are provided in the second casing **102**, the first support component **151** and the second support component **152** may be provided in the second casing **102** and the first auxiliary axial-component **141** and the second auxiliary axial-component **142** may be provided in the first casing **101**. In this case, for example, the first auxiliary axial-component **141** or the second auxiliary axial-component **142** projects toward the inner side from an inner surface of a projecting component that projects from the corner portion, on the far side, of the first casing **101**. On the outer side surfaces **121***a* and **122***a* of the projecting case components **121** and **122** of the second casing, recesses into which the first auxiliary axial-component **141** and the second auxiliary axial-component **142**, respectively, fit are formed.

Furthermore, although, in the first and the second embodiments, the recesses **156** and **166** in the first support component **151** and the second support component **152**, respectively, are each open only on the front side, each of the recesses **156** and **166** may be open on both the front side and the rear side. In this case, the second auxiliary axial-component **142** may be formed so as to have a flat top surface and a roughly circular-cylindrical shape, and may be fixed to the second projecting case component **122**, similarly to the first auxiliary axial-component **141**.

Further, although, in the first and the second embodiments, the first auxiliary axial-component **141** is formed in almost a circular cylindrical shape, the first auxiliary axial-component **141** may be formed in another shape (for example, a polygonal column).

Furthermore, in the first and the second embodiments, the second auxiliary axial-component **142** may function as an axial-component, and may be formed in a shape (for example, a spherical shape) other than a column-like shape.

As presented above, the embodiments have been described as an example of the technology according to the present disclosure. For this purpose, the accompanying drawings and the detailed description are provided.

Therefore, components in the accompanying drawings and the detailed description may include not only components essential for solving problems, but also components that are provided to illustrate the above described technology and are not essential for solving problems. Therefore, such inessential components should not be readily construed as being essential based on the fact that such inessential components are shown in the accompanying drawings or mentioned in the detailed description.

Further, the above described embodiments have been described to exemplify the technology according to the present disclosure, and therefore, various modifications, replacements, additions, and omissions may be made within the scope of the claims and the scope of the equivalents thereof.

What is claimed is:

1. An electronic device comprising:

a first casing;

a second casing connected to the first casing such that the electronic device is openable and closable, the second casing having a display provided on a surface on the first casing side;

a projecting component that projects from a top side surface of the first casing, and is positioned on the top side surface of the first casing at such a position as to abut against the display when the electronic device is closed; and

a movable support section configured to support the projecting component so as to allow the projecting component to move relative to the first casing such that an amount of projection of the projecting component from the top side surface of the first casing is reduced when the projecting component is pushed by the display in the case of the electronic device being closed,

wherein the movable support section supports the protecting component so as to allow the projecting component to rotate outward of the first casing by pivoting about a support axial-component that is supported so as to be rotatable relative to the first casing.

2. The electronic device according to claim 1, further comprising

a rotation mechanism configured to connect the second casing to the first casing so as to allow the second casing to rotate relative to the first casing such that switching is performed between a normally opened position in which the display faces the first casing side and an inversely opened position in which the display faces a side opposite to the side which the display faces in the normally opened position, in a state where the electronic device is opened, wherein

the projecting component is positioned on the top side surface of the first casing at such a position as to abut against the display only when the electronic device is closed in the course of switching between the normally opened position and the inversely opened position.

3. The electronic device according to claim 1, wherein a pivot of the support axial-component is positioned, in the first casing, inward of a position in the projecting component at which the projecting component abuts against the display.

4. The electronic device according to claim 1, wherein the movable support section further includes an elastic component configured to restoring a position of the projecting component which has been pushed by the display and moved.

5. An electronic device comprising:

a first casing;

a second casing connected to the first casing such that the electronic device is openable and closable, the second casing having a display provided on a surface on the first casing side;

a projecting component that projects from a top side surface of the first casing, and is positioned on the top side surface of the first casing at such a position as to abut against the display when the electronic device is closed;

a movable support section configured to support the projecting component so as to allow the projecting component to move relative to the first casing such that an amount of projection of the projecting component from the top side surface of the first casing is reduced when the projecting component is pushed by the display in the case of the electronic device being closed; and

a rotation mechanism configured to connect the second casing to the first casing so as to allow the second casing to rotate relative to the first casing,

wherein the projecting component supports an axial-component used when the electronic device is opened and closed, so as to allow the axial-component to rotate.

6. An electronic device comprising:

a first casing;

a second casing connected to the first casing such that the electronic device is openable and closable, the second casing having a display provided on a surface on the first casing side;

a projecting component that projects from a top side surface of the first casing, and is positioned on the top side surface of the first casing at such a position as to abut against the display when the electronic device is closed;

a movable support section configured to support the projecting component so as to allow the projecting component to move relative to the first casing such that an amount of projection of the projecting component from the top side surface of the first casing is reduced when the projecting component is pushed by the display in the case of the electronic device being closed; and

a rotation mechanism configured to connect the second casing to the first casing so as to allow the second casing to rotate relative to the first casing,

wherein the rotation mechanism has a main axial-component used when the electronic device is opened and closed,

one of the second casing and the projecting component has an auxiliary axial-component that is positioned on an extended line of the main axial-component in the normally opened position and that is used when the electronic device is opened and closed, and

the other of the second casing and the projecting component supports the auxiliary axial-component so as to allow the auxiliary axial-component to rotate when the electronic device is opened and closed.

7. The electronic device according to claim 6, wherein

the rotation mechanism connects a rear side portion of the first casing to the second casing,

the projecting component is provided at a corner portion on a rear side of the first casing, and

the movable support section supports the projecting component so as to allow the projecting component to rotate outward of the first casing by pivoting about a support axial-component that is supported so as to be rotatable relative to the first casing and that extends in a front-rear direction of the first casing.

8. The electronic device according to claim 7, wherein a pivot of the support axial-component is positioned, in the first casing, inward of a position in the projecting component at which the projecting component abuts against the display.

9. The electronic device according to claim 7, wherein

the first casing includes a leg component that projects from a back surface of the first casing at a position reverse of a position of the projecting component,

the projecting component is integrated with a corner component that forms a corner portion of an outer circumferential surface of the first casing, and

the projecting component is rotatable to a limit position at which a lower end of the corner component abuts against an outer surface of the leg component, by pivoting about the support axial-component, and

a top end portion of the projecting component which has been rotated to the limit position is almost level with the top side surface of the first casing.

10. The electronic device according to claim 6, wherein

the auxiliary axial-component is provided in the second casing,

the projecting component supports the auxiliary axial-component so as to allow the auxiliary axial-component to rotate, in the inversely opened position,

an axial-component receiving section configured to support the auxiliary axial-component so as to allow the auxiliary axial-component to rotate, in the normally opened position, is fixed to the first casing, and

the rotation mechanism is structured such that the second casing is rotatable relative to the first casing only in a first rotation direction that causes the display to face the projecting component in the course of the normally opened position being switched to the inversely opened position, and the second casing is rotatable relative to the first casing only in a second rotation direction opposite to the first rotation direction in the course of the inversely opened position being switched to the normally opened position.

* * * * *